FOUNDRY
EST. 1902 TRADE JOURNAL
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
VOL. 104
No. 2166
Registered at the G.P.O. as a Newspaper
APRIL 17, 1958
Offices: John Adam House, John Adam St., London, W.C.2
Single Copy, 1/-. By Post 1/4. Annual Subscription, Home 52/-, Abroad 60/- (Prepaid)

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- CLEVELAND - U.S.A

A.F.S. FOUNDRY SHOW - MAY 19-23, 1958

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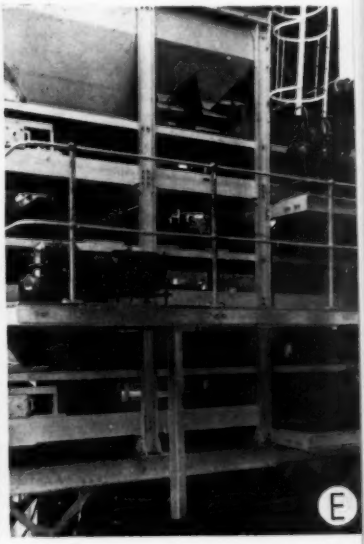
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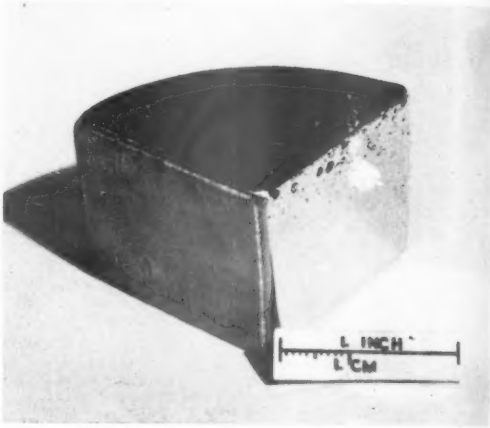

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Vol. 104 April 17, 1958 No. 2166

Established 1902

Incorporating

IRON & STEEL TRADES JOURNAL

Single copy 1s.; *by post* 1s. 4d.

Annual subscription: home 52s., *abroad* 60s. (*prepaid*)

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.

Commercial Editor: P. E. CARDEN.

Advertising Manager: F. BARRINGTON HOOPER, B.A.

Production Manager: R. J. LOVELL

Publisher: H. J. DWYER

Circulation Manager: E. T. GRIFFITHS

District Representatives:
G. P. ELLIOTT (Northern Area)
T. H. SMITH (Scotland)

The FOUNDRY TRADE JOURNAL is the official organ of the British Steel Founders' Association; Association of Bronze & Brass Founders; Light Metal Founders Association; Foundry Trades' Equipment & Supplies Association; and the National Society of Master Patternmakers.

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Every Thursday by Industrial Newspapers, Limited

BARRINGTON HOOPER O.B.E., *Chairman and Joint Managing Director*

F. BARRINGTON HOOPER, B.A., *Joint Managing Director and Commercial Director*

F. R. LEWIS, *Director*

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JOHN ADAM HOUSE, 17-19, JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 (*Private Branch Exchange*)
Telegraphic Address: "Zacatecas, Rand, London."

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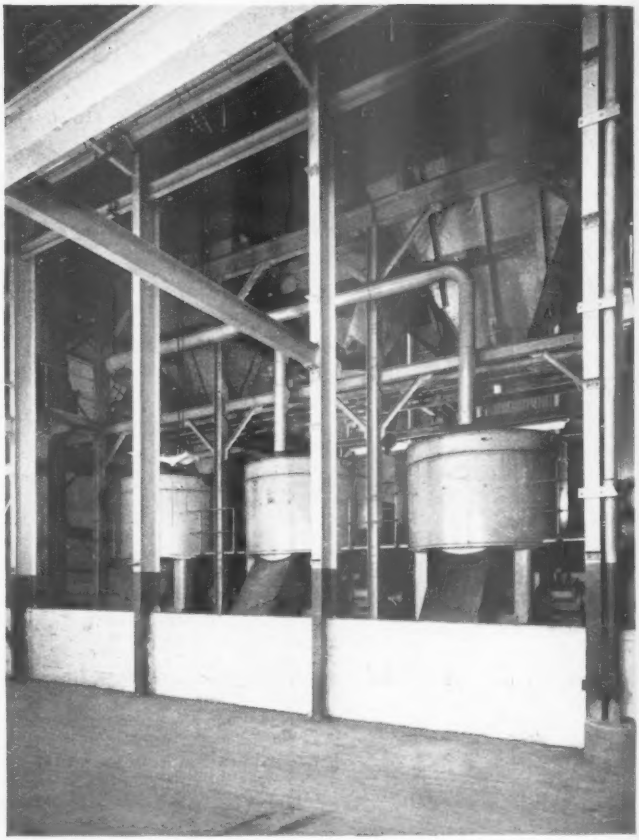
★
The MIXING SECTION IN A LARGE IRONFOUNDRY

Photograph shows: Three No. 3F size August-Simpson Mix-Mullers with Returned Cleaned Sand and New Sand Storage Hoppers. A travelling, electrically operated Batch Measuring Hopper (fitted with Weighing device) Charges the sand into each Mix-Muller. The Mixed Sand is discharged from the Mix-Mullers on to a Belt Feeder Conveyor for transfer to the Distribution Belt Conveyor.



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FOUNDRY
TRADE JOURNAL

Vol. 104 APRIL 17, 1958 No. 2166

Selling in Europe

Some loose thinking is being evidenced when consideration is being given to selling in the European Common Market. The marketing of goods where the man in the street is the buyer, such as food-stuffs, clothes, radios and the like, is quite different from that of finding customers for capital goods or making contact with one specified industry overseas. The foundry industry in the main, through its customers, enters into the second character and the equipment industry, the third. There is a section, however, which to sell has to reach the ordinary public—this includes the makers of hardware and domestic appliances—but here, there is no common denominator. We deem that in electric cookers and to a lesser extent, gas ovens, the types used in Europe are of much the same type as our own, but solid-fuel-fired apparatus, for space heating or cooking, are quite different, and this applies also to cooking and water heating, except for the most efficient *de luxe* types. Where our types of cookers and the Continental ones do converge is where bottled gas is used. Their use is rapidly expanding in rural areas which are well served by the suppliers of propane gas and the like.

To reach these users, there are exactly the same methods as here, the Press, the hoardings and television, but for each country a special technique has to be found and applied, which we believe can only be done by its nationals. We remember that in one country we suggested to the director of an employers' federation that they should promote a Bill to make it compulsory for every house to be provided with bathing facilities. This caused amusement as there was insufficient water available for such a project. That and similar experience leads us to the conclusion that publicity should be delegated to overseas experts, who are quite well known and often work in association with the British houses. For the sale of specialized goods, there is nothing better than the firms' own technical salesmen speaking the language of the country constituting his territory. When a foreign visiting card is handed in anywhere, it is usual for the caller to be received by an important executive, either through curiosity or courtesy—perhaps both.

One of the problems to be solved relates to the numerous cases where concerns have been granted exclusive manufacturing licences to serve defined territories. Will these private trading agreements be allowed to continue and will new ones be permitted to be established? In the voluminous literature on the subject of the Common Market that has been released, we have seen references to monopolies as well as hidden subsidies in the form of preferential treatment by the transport authorities. Each type of concern desiring to do business in the Common Market will have to learn all the snags which exist and no doubt will persist in selling their goods.

15,000 Foundrymen Expected at Cleveland

Final preparations are now being made for the 1958 American Foundry Show to be held in Cleveland Public Auditorium, from May 19 to 23, in conjunction with the 62nd Castings Congress. Both events are sponsored by the American Foundrymen's Society, Des Plaines, Illinois. It is reported that there is a definite trend in the show for more and more exhibitors to use working models to demonstrate equipment and methods, and this year, at least 50 per cent. of the exhibits will enter into this category, giving the audience an opportunity to make on-the-spot comparisons of equipment being offered. It is also pointed out that, to-day, buyers not only want specialized equipment, but are also looking for machines which are adaptable. In fact, nowadays, the working exhibits are converting industrial shows into "proving grounds."

At the show there will be £1,700,000 worth of equipment and supplies displayed, and although working models and equipment operation inevitably involve more work for the show management, the trend is being encouraged. This year, to supplement the exhibition-hall demonstrations, films of exhibitors will be shown in two "little theatres" which will be set up in the auditorium. Another new feature is to be a special automobile castings exhibit, and with it a raffle for three 1958-model motor-cars. It is believed that the five-day programme will attract 15,000 foundrymen from domestic as well as international foundry companies.

Nitrogen Plant Contract

African Explosives and Chemical Industries, Limited, have announced that they are increasing the capacity of their No. 2 ammonia unit at their Modderfontein factory and that they have awarded certain contracts for extensions and additions to this unit to the Power-Gas Corporation, Limited, Stockton-on-Tees, England and their associate Ashmore, Benson, Pease & Company, Africa (Pty), Limited, of Johannesburg.

The contract for the gasification section covers modifications to the existing fixed-bed dry-base generators which are to be converted from cyclic semi-water gas operation to continuous oxygen/steam gasification. The fuel to be gasified is coke produced by the low-temperature carbonization of local non-caking coals. These modifications together with extensions involving the installation of two new generators are to be carried out by Ashmore, Benson, Pease & Company Africa (Pty), Limited, to the designs of the Power-Gas Corporation Limited. The detailed engineering, supply and erection of the extensions to the gas purification sections of the existing plant will be carried out by the Power-Gas Corporation, Limited, in accordance with basic design data supplied by African Explosives and Chemical Industries, Limited, and Imperial Chemical Industries, Limited (Billingham Division).

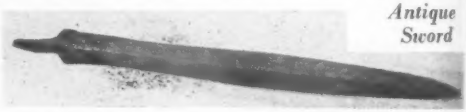
F. PERKINS, LIMITED, Peterborough, has received an order for the supply of 3,050 diesels to Yugoslavia. The order is for 2,250 three-cylinder Perkins P3 engines for installation in Massey-Ferguson "35" tractors and for 800 four-cylinder P4 engines for Yugoslav-built Zadrugar tractors. Deliveries will be completed by the end of the year. The company has previously obtained orders totalling £2,500,000 from Yugoslavia since the Yugoslavs standardized on Perkins engines three years ago.

Film Review

Mechanical Handling. It would be difficult to imagine better propaganda for an exhibition than this annoted colour film which shows in detail the machinery installed at the last mechanical handling exhibition. If one be honest, one will state that undoubtedly one learns more from the film about exhibits as a whole than by a visit to the exhibition, but normally films are not available until some time after the show is closed. It would be of great value if such a film could be available for showing continuously on the second day of an exhibition as it would direct attention to novelties and, what is more important, enable the visitor to use his available time to better advantage. For instance, the writer visited the exhibition of two years ago, but apparently missed seeing a high-speed screw conveyor which claimed to reduce the temperature of the material being handled. This, if substantiated, is of importance to mechanized foundries making cored castings. As the exhibition is so near—Earl's Court, from May 7 to 17—one must be content to examine the actual exhibits by walking around, which traditionally is the best way. It promises to be an excellent show.

Discovery in Tankerness

The illustration shows an almost perfectly preserved copy in wood of a bronze sword datable to about 700 B.C. which was discovered last June by a crofter while peat-cutting in the Orkneys. It had lain horizontally at a depth estimated to have been 7 or 8 ft. below the surface of the bog. The pronouncedly leaf-shaped blade, 28½-in. long, has the sharp central ridge of the U-shoulder type of bronze swords. The grip is carved in the round, but had been broken in



Antique Sword

antiquity and the pommel lost. Although it was first thought to be a wooden pattern used for casting a sword, the size and thickness of the blade, and the complete hilt polished by handling, rule out the idea of it being a model for making clay moulds. The sword has been acquired by the National Museum of Antiquities of Scotland, which is housed in Edinburgh. [The JOURNAL is endebted to Mr. R. B. K. Stevenson, keeper of the museum for this information.]

Combustion Engineering Association Appointments

The Council of the Combustion Engineering Association has appointed the following to hold office for the year 1958/59:—As president, Mr. S. P. Chambers, C.B., Imperial Chemical Industries, Limited; as vice-presidents, Sir John Charrington, Charrington, Gardner, Locket & Company, Limited; Mr. G. D. Elliott, John Thompson (Australia) Pty., Limited; Mr. H. C. Hawkins, M.INST.F., British Xylonite Company, Limited; Sir Percy Sanders, C.B.E., Davey, Paxman & Company, Limited; Mr. R. H. E. Thomas, O.B.E., National Coal Board, and Sir Edward Thompson, J.P., M.A., John Thompson, Limited; as chairman of the Council, Mr. L. N. Horne, F.INST.F., Charrington, Gardner, Locket & Company, Limited, and as honorary treasurer, Mr. E. W. Barnes, M.INST.F., Riley (IC) Products, Limited.

Production Methods for Shell-moulded Cast Crankshafts*

By H. N. Bogart and H. C. Grant

The article describes the method of shell-moulding crankshafts in current use by Ford Motor Company in America and outlines the phases through which it was evolved after the company had decided, for reasons of manufacturing economy, to turn from forged to cast crankshafts. It was found that shell-moulding methods produced an article having unique wear-resisting properties and a number of definite advantages over the earlier forged types. The authors describe the evolution of the present type of crankshaft as an illustration of the benefits arising from close co-operation between manufacturing and production-engineering personnel.

To gain a complete perspective of the present use of shell-moulded crankshafts in the Ford Motor Company, it is desirable to go back over 23 years to that time, in 1933, when the company decided to introduce its first cast automobile crankshaft. Then, as to-day, the automobile industry was interested in manufacturing economies which, by virtue of the automobile volume, could be translated into substantial money savings. It was in this spirit that the original cast crankshaft was conceived and that the two-step evolution from forged to shell-moulded crankshafts began.

Traditionally, the crankshaft had been made by conventional forging techniques and Ford had accumulated extensive manufacturing skill and facilities for forging crankshafts. However, it became apparent that the method of obtaining the rough crankshaft, *i.e.*, forging, imposed severe requirements on the finishing (machining) operations. These included machining all surfaces, functional and non-functional alike, several straightening operations required to maintain bearing alignment during machining, and hardening operations to improve the wear-resistance of any forgeable material.

It was with these primary considerations in mind that the cast crankshaft was contemplated. The prospect of greater design flexibility supplied secondary motivation. Engineering support was first attracted to the casting when it was demonstrated that it was possible more completely to counterweight for couple balance and to cast lightener holes in the bearings for improved rotational characteristics. Additional engineering support was engendered when subsequent tests demonstrated the greatly improved wear-resistance and damping qualities inherent in crankshafts made by the new process.

Moulding Using Stacked Slab Cores

A dry-sand moulding method was adopted after extensive investigation had surveyed and rejected the optional green-sand mould and permanent-mould (gravity-die) methods. As may be seen in Fig. 1, the method developed for obtaining four castings with a single set of foundry operations is ingenious enough to merit some description. In the pattern development, four vertical crankshaft patterns were symmetrically grouped about a central sprue. A series of horizontal cuts through the assembly yielded pattern subsections which were fastened and located in 16 metal coreboxes in such a way that assemblies of cores produced from these boxes accurately reproduced a mould cavity for a crankshaft. From these patterns, oil-bonded sand-slab cores were made, baked, coated, and assembled in a partially-mechanized set-up. (Fig. 2.)

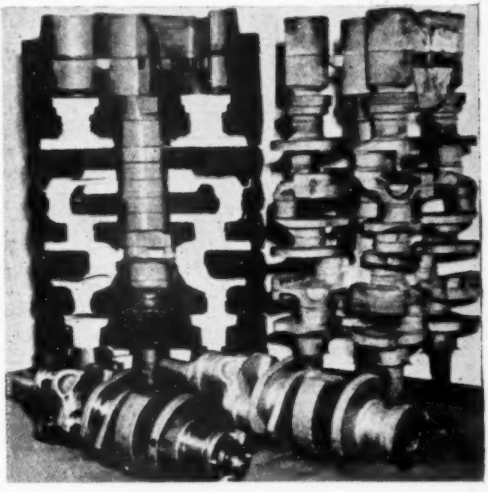


FIG. 1.—*Crankshafts made from stacked slab cores.*

A specially-designed 1.5 per cent. carbon-ferrous alloy was ladled from the electric melting furnaces to the central sprue formed in the stacked cores The four castings so produced were automatically conveyed through a series of conventional cleaning operations to the heat-treatment area. Here a unique six-hour normalizing and spheroidizing heat-treatment relieved stresses and produced a microstructure consisting of a steely matrix with interspersed aggregates of graphite particles. As will be noted later, these graphite discontinuities

* A paper presented to the 1957 annual meeting of the American Society of Automotive Engineers. The authors are attached to Ford Motor Company of America.

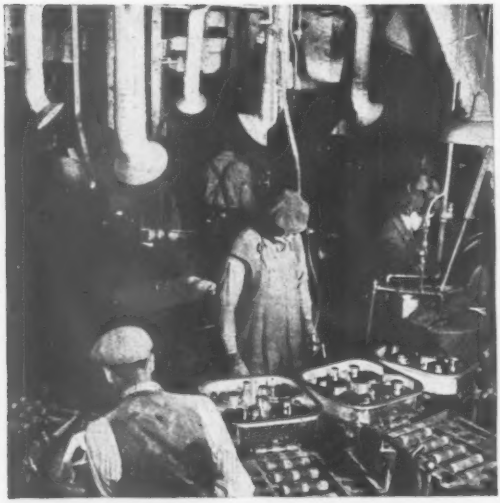


FIG. 2.—*Pattern development in the production of oil-bonded sand slab cores for crankshafts:—slab coreboxes mounted on sandslinger (top left); green cores being removed from coreboxes (top right); slab core assembly (bottom left).*

acted as chip-breakers to improve the machinability and imparted a certain self-lubricating quality to the bearing surfaces which reduced journal wear in service.

The machine shops benefited immediately through the elimination of straightening and heat-treating operations as well as from the drastic reduction in a number of machining operations. A battery of cheek-machine tools was eliminated and the finish stock removal dropped from 18 to 9.5 lb. with a minute cost reduction of 20 min. per crankshaft.* Tool consumption was sharply reduced as were floor-space requirements. Of equal importance were the many engineering advances resulting from the unique combination of this, then new, casting method and new engineering material. In many different areas, greater design flexibility was made available to the engineer. The advances included:—(*a*) Lightening the bearings by coring to improve rotational characteristics and to eliminate the equivalent counterweighting mass. (*b*) Couple balance for smoother engine operation through full counterweighting. (*c*) Redistribution and reduction of weight by making counterweights thicker at their maximum distance from the axis of rotation. (*d*) A wide range in the selection of bearing-insert material as a result of the self-lubricating properties of the alloy.

The cast crankshaft process introduced in 1933 indeed represented a major technical advance in the field of metallurgy and foundry engineering. Experience gained in more than 15 years of operating this process pointed the way to certain major refinements which improved the cast crankshaft as an engineered part.

The desired refinements to the process included:—(*a*) the provision of a continuous supply of molten metal as a replacement for the batch process and, (*b*) a further reduction in the machining allowances typical of those required in normal casting operations. As a result of these and other limitations, the process was periodically reviewed in light of the more recent technical advances in the foundry. It was not unnatural then, that, when pilot work for casting the automotive valve in shell moulding had demonstrated the castings could be produced with as little as 0.003 to 0.007 in. finish stock on the stem diameter and that completely automated

* "How Ford V-8 Crankshafts are Cast and Machined," W. F. Ploch, *SAE Journal*, May, 1936, pp. 21–24.

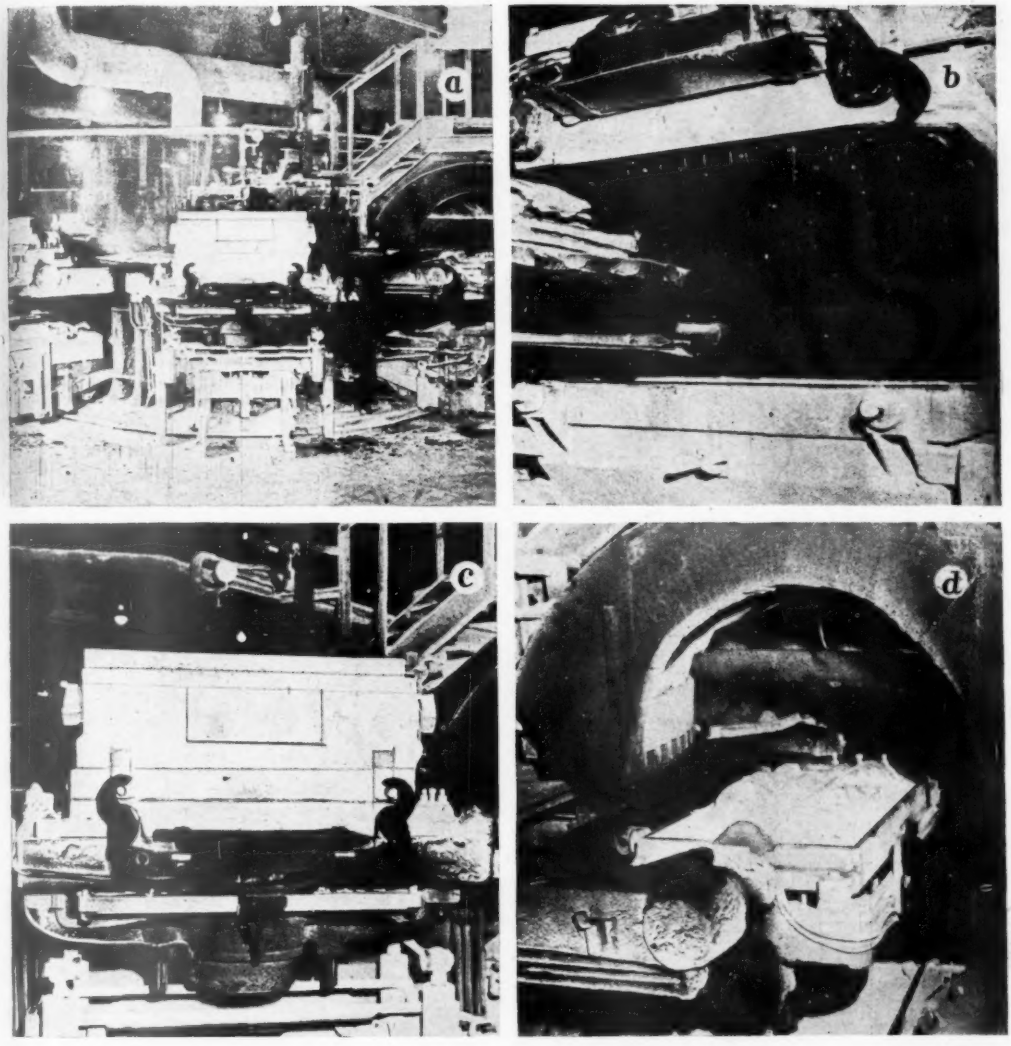


FIG. 3.—*Making shell moulds for crankshafts (a) six individual shell-moulding machines mounted on a turntable (b) raising the dump box to the heated pattern (c) the inverted dump box places sand resin mixture on the hot pattern and (d) final cure of shell as shell-making machine is rotated under a radiant heater.*

operations could be envisaged, experiments would be initiated to extend this method to the production of crankshafts.

Shell-moulding Process

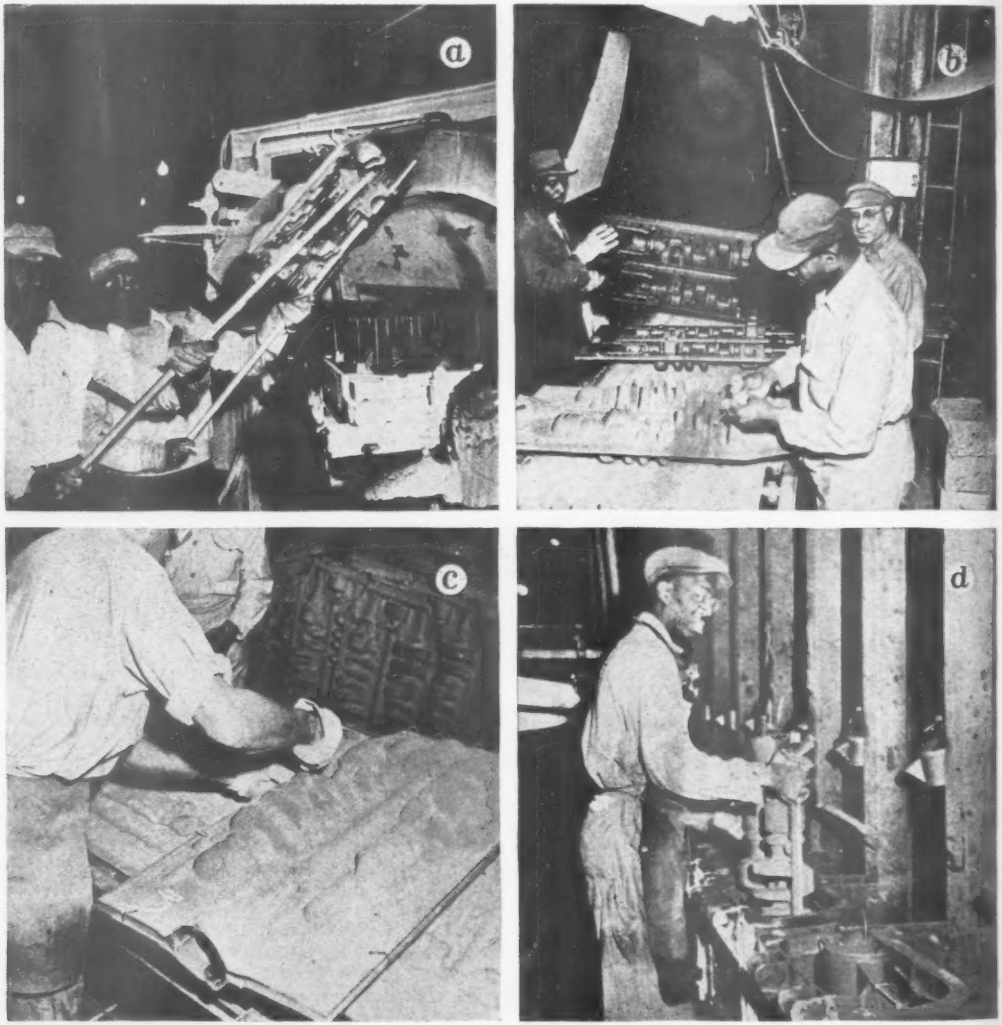
The shell-moulding process itself consists of placing a mixture of sand and thermosetting resin on a preheated pattern and allowing this mixture to remain in contact with the warm pattern until the resin has melted to form a rather gummy plastic mass, removing the excess unmelted sand-mixture, completing the curing of the resin by supplying additional heat until a hard thin shell is formed, and removing this shell from the warm pattern by some stripping mechanism. Stripping the rigid shell at this point results in a precise reproducible mould component, upon which the close precision of the resultant castings are based. After

Shell-moulded Crankshafts

the shells have been removed from the pattern, they are assembled and supported in a flask in some manner to give sufficient strength to the shell to resist the pressure of the molten iron. The so-called "dump-box" adaptation of this principle has been used in the Ford practice.

Shell-moulds for crankshafts are made on individual shell-making machines so mounted on a large turntable that the entire shell-making operation can be performed during a single rotation of the table. Six individually-activated shell-moulding machines are mounted about the periphery of this turntable. (Fig. 3 (*a*).) The patterns are continuously cycled through the various stations, including preheating of the patterns, application of liquid parting agent, and dump-coating the pattern with a mixture of sand and resin to form a $\frac{3}{16}$-in. semi-plastic shell. The coating and dumping operation is made possible by trunnion-mounting the pattern to allow it to rotate around a horizontal axis inde-

FIG. 4.—*Continuing the process shown in Fig.* 3—(*a*) *stripping and removing the cured shell* (*b*) *selection of shells* (*c*) *assembly of shells which are joined together by spring loaded clips* (*d*) *loading shells into flasks.*



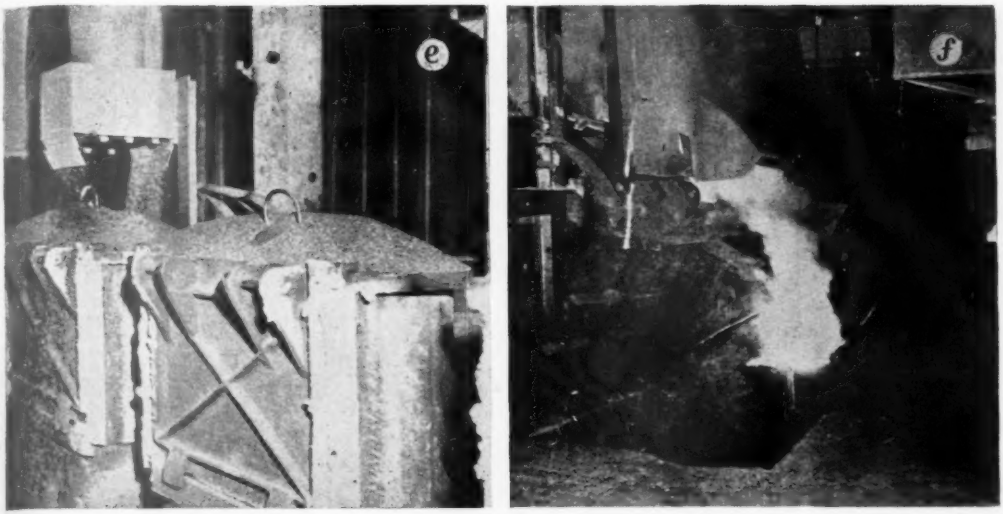


FIG. 4, CONTINUED.—*(e) Gravity hopper filling shell moulds with commercial cleaning shot (f) molten nodular iron poured into moulds.*

pendent of the turntable rotation. (Figs. 3 (*b*) and 3 (*c*).) Final cure of the thin shell is accomplished as the shell-making machine is rotated under a radiant heater. (Fig. 3 (*d*).) The shell is automatically stripped from the pattern and manually transferred to the assembly table. Fig. 4 (*a*) shows stripping and removal of cured shell. Since each pair of shells produces two crankshafts, each turntable rotation, requiring two minutes, makes shells for six crankshafts.

Special pattern design allows complete interchangeability of all patterns for identical crankshafts. The casting symmetry is such that, by mounting both pattern segments as right- and left-hand members of the pattern assembly, a single pattern can be used for both halves of a completed assembly. (Fig. 5.) Thus, in assembly, shells selected at random are joined together by spring-loaded clips (Fig. 4 (*b*) and (*c*)) and inserted into an open-top, bottom-hinged, basically-rectangular flask mounted on the pouring line (Fig. 4 (*d*)). The flask is conveyed to the loading station where an overhead gravity-hopper drops commercial cleaning shot into the flask cavities to support the thin shell-mould against the internal pressure of the molten iron. (Fig. 4 (*e*).) The flask is then advanced to the pouring station where previously-prepared molten nodular iron is poured into the moulds. (Figs. 4 (*f*) and 6.)

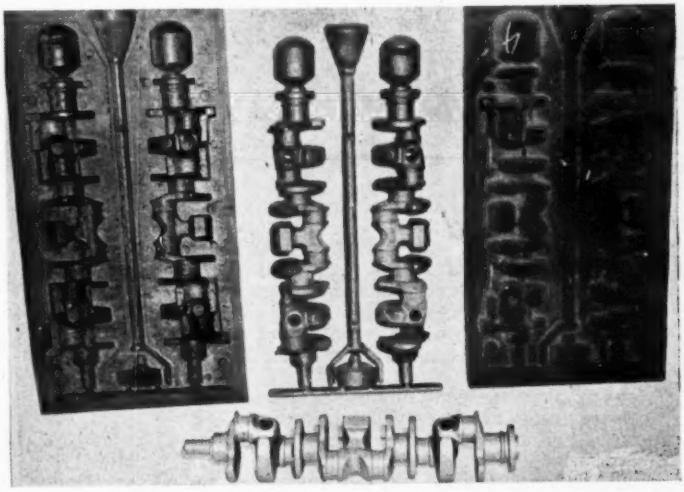


FIG. 5.—*Pattern mounting showing use of a single pattern for both halves of an assembly.*

The castings continue on the pouring line for an additional 30 min. until they reach the shake-out station where the castings, plus gates and risers

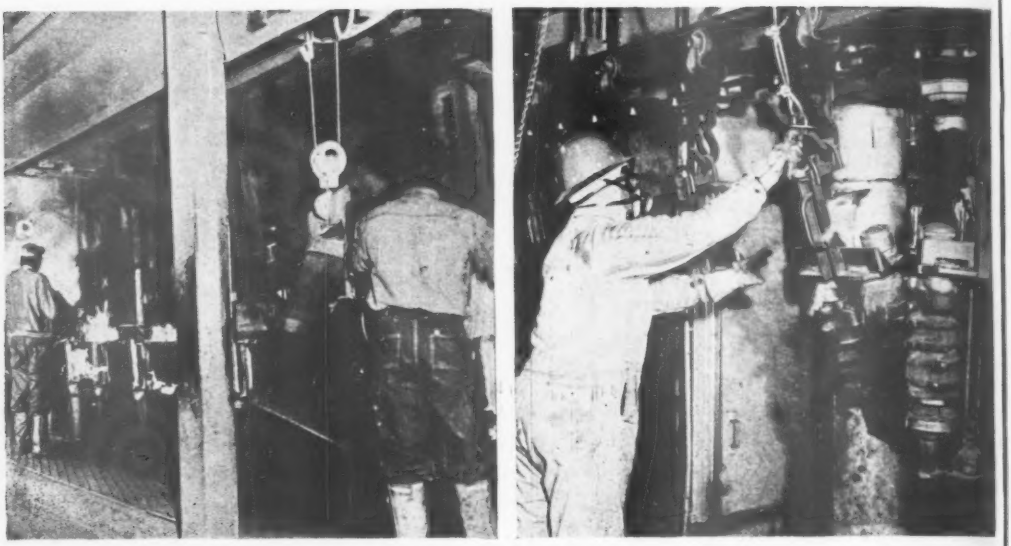


FIG. 6.—*Shell-moulding procedure, showing pouring (left) and castings at shake-out station (right).*

(Fig. 6), are transferred to a cooling conveyor on which the castings proceed through a cleaning operation, and through break-off and inspection operations until they are delivered to the dispatch department. By comparison with conventional sand castings or the previous type of cast crankshaft, cleaning costs are at a minimum. While retaining all of the advantages of the older casting, additional process advantages have been realized by this new founding technique. Analysis of these advantages can be facilitated by separate examination of the advancements in the foundry and in the machine shop.

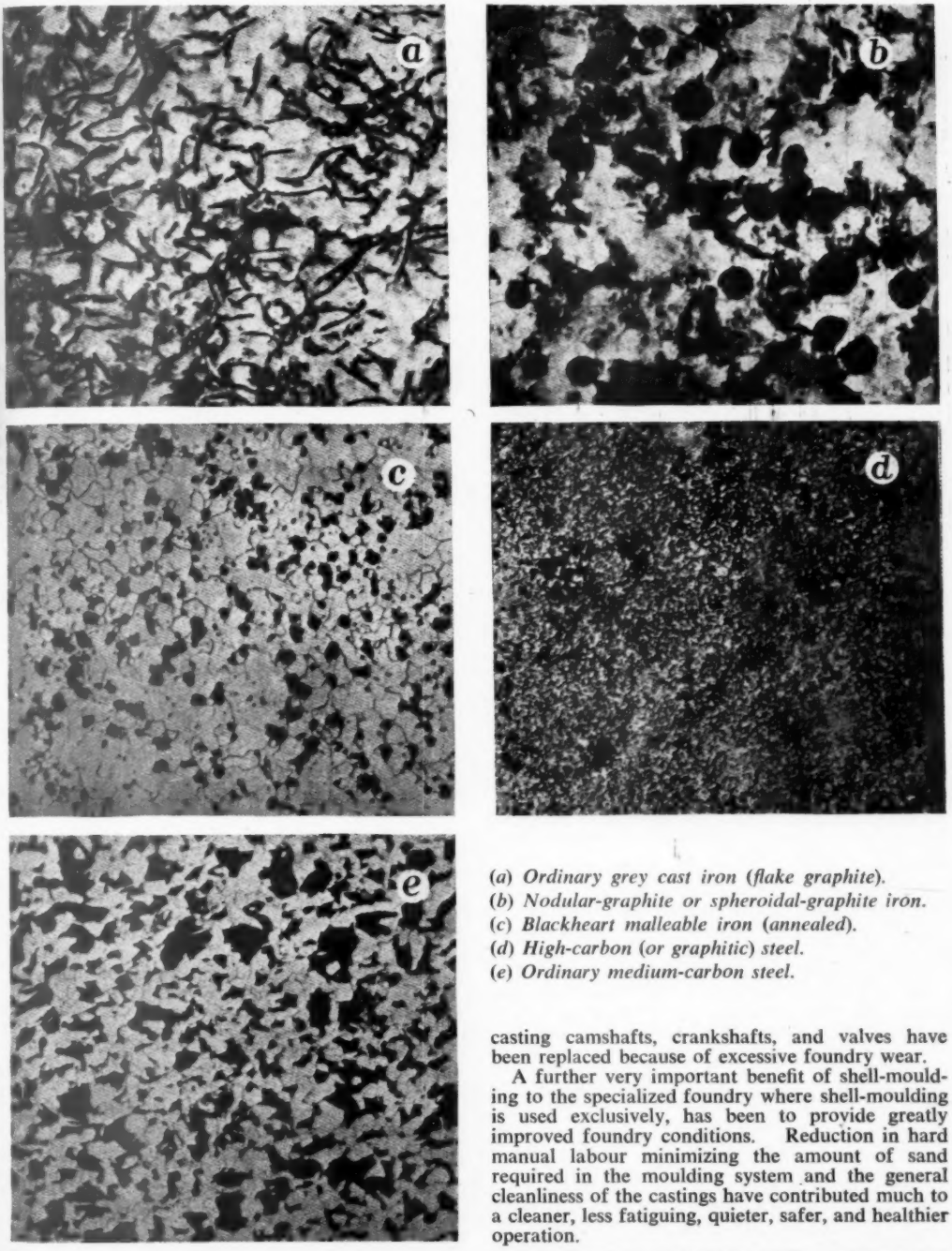
Advantages of Shell-moulded Crankshafts

The outstanding advantage of the shell-moulded crankshaft as far as the foundry is concerned is the manner in which the entire process responds to a high degree of automation. The adaptation of automation begins in the melting area where nodular iron is produced continuously from advanced-design cupolas and continues throughout the moulding, cleaning, and inspection operations. As has been demonstrated, the operations are so divided that an effective combination of mechanical activation and manual labour is possible. Another major advantage relates to the very close tolerances which are maintained from casting to casting. This improved uniformity not only produces dimensionally near-perfect crankshafts, but also allows effective use of quality control procedures for inspection, gauging, and metallurgical examination. This is particularly important in that no qualification of the locating points used in the machining operations is necessary.

Raw-sand requirements for crankshaft manufacture have been reduced from 125 lb. per casting in the previous casting method of 20 lb. per casting with shell-moulding. This not only conserves what is becoming a near-strategic mineral, *i.e.*, good foundry sand, but also greatly simplifies the problem of refuse-sand disposal, with or without sand reclamation. Of equal importance are several secondary considerations which allow more effective utilization of skilled foundry engineers. In the process employed by Ford, uniform feeding characteristics are obtained. As a result, sound castings, free from shrinkage or defect, are consistently produced and no major changes in pattern gating have been required during the last four years. Furthermore, foundry engineering required to meet quality standards during model change-over has been substantially eliminated. Similarly, experience has shown the process to require less pattern maintenance. None of the many patterns used in

TABLE 1.—*Typical Chemical and Physical Properties of Ferrous Cast Materials.*

—	Cast iron (flake graphite)	Nodular iron (nodular graphite)	Malleable iron.	Graphitic steel.	Ordinary steel.
Chemical composition, per cent.:					
Carbon	3.50	3.50	2.50	1.50	0.30
Manganese	0.70	0.70	0.35	0.80	0.70
Silicon	2.50	2.50	1.25	1.00	0.40
Magnesium ..	—	0.020	—	—	—
Physical properties:					
Yield point (tons per sq. in.) ..	—	29.0	14.5	35.7	15.6
Tensile strength (tons per sq. in.)	13.4	40.1	22.3	47.0	29.0
Elongation (per cent.)	—	2	10	3	24
Modulus of elasticity (lb. per sq. in. $\times 10^6$) ..	17.0	22.5	25.0	28.5	30.0



(*a*) *Ordinary grey cast iron (flake graphite).*
(*b*) *Nodular-graphite or spheroidal-graphite iron.*
(*c*) *Blackheart malleable iron (annealed).*
(*d*) *High-carbon (or graphitic) steel.*
(*e*) *Ordinary medium-carbon steel.*

FIG. 7.—*Typical photomicrographs* of ferrous cast metals.*

casting camshafts, crankshafts, and valves have been replaced because of excessive foundry wear.

A further very important benefit of shell-moulding to the specialized foundry where shell-moulding is used exclusively, has been to provide greatly improved foundry conditions. Reduction in hard manual labour minimizing the amount of sand required in the moulding system and the general cleanliness of the castings have contributed much to a cleaner, less fatiguing, quieter, safer, and healthier operation.

* No magnifications are quoted by the authors for the photomicrographs, but it is obvious that they are not uniform. —EDITOR.

Shell-moulded Crankshafts

As a result of the many foundry advantages enumerated, the rough crankshaft as delivered to the machining operations is distinctly superior to that available from any other fabrication method. As, in previous practice, Ford manufacturing engineers have been able to utilize these process-characteristics further to reduce manufacturing cost. The increased precision of the casting has resulted in a reduction in the machining from 9.5 lb. in the previous casting practice to 5.5 lb. in the shell-moulding process. Thus, the complete transition from the forged shaft to the shell-moulded shaft has resulted in a 70 per cent. reduction in the weight of the chips produced. The influence of this spectacular reduction in total machining on machine-cycle time and minute cost is obvious.

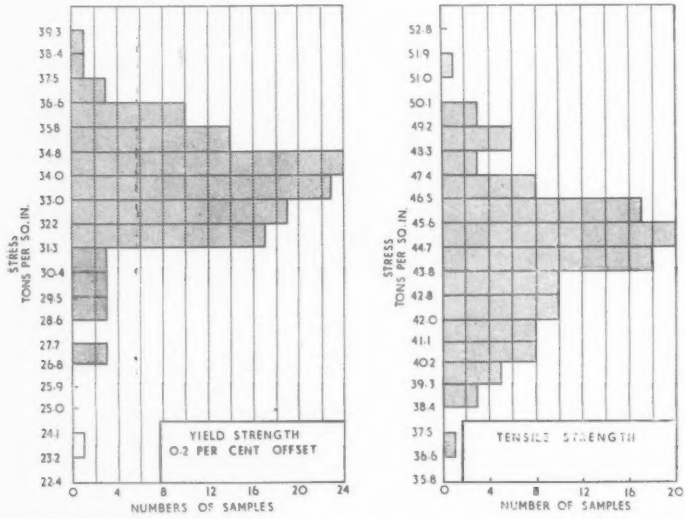


FIG. 8.—*Mechanical properties of nodular iron as exemplified by 125 samples taken from crankshafts as cast over a 25-week period.*

In the same area, moreover, additional advantages have accrued. Specifically, the increased precision with the absence of warpage allows fast traverse in many machining operations until actual contact is made between the tool and the work piece. The closer tolerances available in this casting procedure also improve the balancing operation. Here, by very close control of the balance weight location, preliminary balance has been eliminated and final balance has been typically limited to drilling a $\frac{7}{8}$ in. diameter hole less than 1 in. deep into the two-end counterweights. Similarly, the centring operation itself has been so simplified by this careful control of mass location that the need for mass centring machines has been eliminated. Present practice uses 100 per cent. geometric centering.

The close tolerances to which these castings are held may be illustrated by reference to a recent model year where over 1,000,000 crankshafts with an allowable 0.0285 in. clearance between the crank-cheek outside diameter and the camshaft distributor gear were assembled into engines without machining at this location. No single instance of interference was encountered. Another important benefit growing out of the very precise location of all portions of the casting has been a reduction of maintenance expenses due to tool and machine-tool damage resulting from inadequate clearance during the machining operations. It is obvious that each of these many advantages has contributed substantially to the reduction cost in the machining area, especially as it affects the tool cost.

Another potent factor that influences tool cost, fortunately in the right direction, has been the absence of small sand particles in the casting skin as has been evidenced in many conventionally-cast components. Important as all of these processing advantages are, they have been accomplished with no sacrifice of engineering properties. In fact, many additional engineering advantages are available through this unique combination of nodular iron and shell moulding.

The outstanding engineering property of the shell-moulded crankshaft is its wear-resistance as shown in Fig. 9. The shell-moulded crankshaft has the best wear resistance of any of the materials which have been historically used in Ford automotive crankshaft manufacture. This wear-resistance is attributable to the self-lubricating property of the free graphite on the bearing surface as shown in the photomicrographs which compare nodular iron with other commercial alloys (Fig. 7). These advantages are achieved in a material whose physical properties compare in many ways to those of steel. Table 1 shows a comparison between typical minimum properties of specimens taken from actual nodular-iron crankshaft castings and separately-cast specimens of cast-iron, malleable iron, graphitic-steel and steel castings.

The typical chemical composition of Ford's crankshaft production is: C 4.00; Si 2.50; Mn 0.50; Cr 0.10; S 0.010; P 0.05; and Mg 0.019 per cent. Data illustrating the consistent physical properties obtained with nodular iron are shown in Fig. 8. These data are a tabulation of 125 quality determinations from samples machined from actual crankshafts.

A second important engineering characteristic is the exceptional endurance of the shell-moulded crankshafts, based on simulated service tests and field results. These outstanding results are the out-

comé of a combination of factors including the improved damping characteristics of the graphite-rich material, the absence of casting defects such as shrinkage, and blows, and the combination of

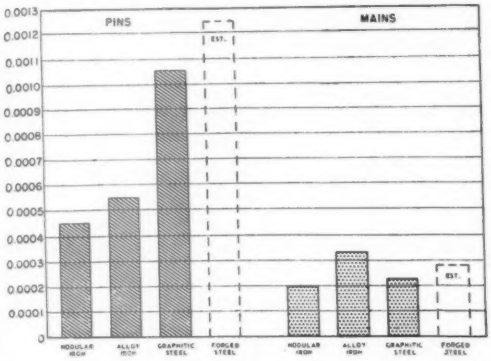


FIG. 9.—*Comparative wear-resistance of shell-moulded crankshafts of different materials. (Wear (in inches) taking place after running for* 200 *hours at* 4,000 *r.p.m.)*

sound design with good manufacturing procedure.

A third valuable engineering advantage is the additional design leeway that the precision-cast crankshaft gives by (*a*) allowing the more efficient distribution of weight, and (*b*) contributing to engine compactness by varying the casting contour to prevent potential interferences.

A fourth advantage has been in the improved balance attainable at a minimum cost. This eliminates drilling balance holes or grinding for balance in critical areas without adequate care to prevent weakening the entire component, leading, and other salvage expedients used to obtain physical balance.

Conclusion

The entire history of the cast crankshaft within the Ford Motor Company has been one of active co-operation between manufacturing and product engineering and is illustrative of the benefits available through the intelligent use of advanced and improved manufacturing technology guided by sound principles of engineering. Without an awareness of the advantages to Ford's manufacturing processes on the part of the product engineer and designer, and a desire to assist in such approaches as were necessary to bring this development to complete fruition, the progress to date would not have been possible. In this field, as in many others, only the threshold of new manufacturing techniques has been reached. The rate at which advance will be made is not alone dependent upon the ingenuity of production and manufacturing engineering personnel, but depends to a large extent upon the ability of manufacturing and product-engineering groups to weld their own ideas and goals into a common objective.

Aluminium Price-drop not Beneficial

Many new applications for aluminium would be spurred by the current adequate supply of the metal, Viscount Portal, chairman, told shareholders at the annual meeting of Canadian British Aluminium, Limited. A 20-year contract with the British Aluminium Company, Limited, the parent company, will assure the sale of the entire output from stages one and two of the Baie Comeau (Quebec) plant.

Recent reductions in the price of aluminium would not have a long-term beneficial effect on the company's progress, Lord Portal forecast. Because the industry needed price stability for long-term planning and investor assurance that the industry could sell its products at prices which would enable newly-installed capacity to generate sufficient funds for healthy expansion, he felt current prices were unrealistic.

It was also announced recently that an agreement had been reached to form a new company to manufacture aluminium wire and cable in Canada. The company, Phillips C.B.A. Conductors, Limited, is a joint enterprise of the Phillips Electrical Company, Limited, and Canadian British Aluminium.

British Wagon Company's Expansion

During 1957 group hire purchase of the British Wagon Company, Limited, Rotherham (Yorks), increased from £8,100,000 to £11,200,000 and much of this expansion was financed with the help of deposit loans which now total £5,100,000, state the directors.

Towards the end of the year a controlling interest was purchased in the Ross Finance Company, Limited, Vancouver. Group net profits were lower at £180,083 (£229,217).

AEI's Record Order-book

During the past four years about £80,000,000 has been added to the capital employed by Associated Electrical Industries, Limited, said the chairman, Lord Chandos, at the annual meeting last week. Rather more than half had been invested in fixed assets such as new buildings and extensions and the rest represented capital for the company's operations. CIC consent had been obtained for a debenture issue, to be made in the middle of the year, which would complete the financing of the present expansion schemes. It will also enable the company to repay £4,000,000 of 10-year notes which fall in next year, and leave adequate cash resources.

Despite additional capacity, orders in hand last year rose to £177,000,000, £40,000,000 more than the previous highest figure in 1956. A notable feature was the orders for 1,500,000 kw of turbine generator plant from six continents. Over 10 per cent. of the order-book is for traction equipment and over £10,000,000 was booked from British Railways during the year.

Delta Metal Prospects

A period of keen competition and lower profit margins is being entered and there is the unknown factor of European Free Trade, states the chairman of the Delta Metal Company, Limited, who can offer no assurance that either profits or dividends will continue at the 1957 level. During the year all the ordinary capital of James Booth & Company, Limited, and Sanbra, Limited, was acquired.

Group net profits totalled £832,757, against £796,621, and the distribution is 30 per cent., less tax, on more capital, against 17½ per cent., tax free, previously.

Titanium Melting Progress

Less than three years since Imperial Chemical Industries, Limited, commissioned Britain's first titanium-melting plant, the largest titanium-melting furnace in Europe has come into operation at the Kynoch Works of the metals division of ICI. This is one of three furnaces supplied by W. C. Heraeus G.m.b.H. (western Germany) for the production of double-melted ingots up to 4,200 lb. in weight by the consumable electrode arc-melting process. Within a few days of the furnace coming into operation, an ingot weighing 4,200 lb.—the largest ever produced outside the US—was successfully melted.

Over and above the prime advantage of producing larger ingots—the scope of fabricating techniques is widened and yield is increased by decreasing surface/volume ratio—the new equipment embodies a number of interesting features. The melting current employed is higher than has ever before been used for this purpose in Europe. The furnace will normally operate with a high degree of vacuum, a pressure of under 10 microns being maintained throughout a melt. Facilities are also provided for melting under a reduced pressure of an inert gas should this be required.

One device which reduces "down time" between melts and effects big improvements in furnace utilization, enables the first-melt ingot to be withdrawn into the upper part of the furnace and held in vacuum while the larger-diameter crucible necessary for the second melt is fitted. Another allows the second-melt crucible, containing the double-melted ingot, to be sealed by a plate valve and withdrawn from the furnace for cooling so that the furnace can be prepared for another melt immediately.

The new installation also incorporates the most advanced measures yet devised to ensure safe working and all operations are carried out by remote control, instruments recording essential data at all stages and providing a system of fault indication and location.

In 1955, ICI found that 18 furnaces were needed for an output of 1,500 tons a year; to-day three are sufficient to produce over 2,000 tons a year. This increased capacity, together with the availability of high-quality ingots in larger sizes, the company believes, is likely to open up still further outlets for titanium.

Indices to Scientific Journals

The FOUNDRY TRADE JOURNAL is among the 510 periodicals that are being indexed by subject and author in a new publication announced recently. These indices, comprising several hundred thousand entries, have been compiled by the Library of the U.S. Naval Research Laboratory. The original index cards are to be reproduced in book form by offset printing, 21 cards per page, 10 in. by 14 in. Author, and subject, sections, and the monthly, quarterly and annual supplements to each, can be purchased separately. The publication will be available only to those who subscribe in advance of printing, which will start in the third quarter of this year. The publication is offered by Micro-Photography Company, 97, Oliver Street, Boston 10, Massachusetts, U.S.A.

CLIMAX ROCK DRILL & ENGINEERING WORKS, LIMITED—Mr. P. M. Holman has been appointed chairman of the company in place of the late Mr. R. Ewing.

Wage Rates and Cost of Living

Index of weekly wage rates at the end of February rose by one point from 112 to 113 (January, 1956=100). The February, 1957, index figure was 107. The cost-of-living index figure on February 18 was 108 (the same as in the previous month) and a year ago, 104. During February nearly 1,600,000 workers received increases in pay estimated to cost over £14,000,000 a year. Automatic increases based on cost-of-living sliding scale agreements in the iron and steel and other industries represent £10,000,000 of this total. Average weekly earnings of nearly 7,000,000 manual workers in all manufacturing industries and some principal non-manufacturing ones reached £10 12s. 5d. in October.

About 115,400 workers lost 212,000 working days in the first two months of the year, compared with 79,700 and 231,000 in the corresponding period last year. Unfilled vacancies have now fallen to their lowest total since the war—208,942, compared with 220,047 at the beginning of the year. For the first time since records of vacancies began to be kept in 1946, the unemployment figure—424,547—is more than double the vacancies figure, but since May, 1956, employers have not been obliged to register vacancies.

Middle East Industrial Projects Corporation

It is announced by the Federation of British Industries that an international organization called MIDEC S.A. was formed recently. Its object will be to further the development of industrial projects in the Middle East in conjunction with Arab and other local interests. Its registered office is in Luxembourg at Rue Aldringer No. 14 and it also has branches in the Hague and Beirut. The present participating countries in MIDEC S.A. are Belgium, Canada, Denmark, France, Western Germany, Holland, Italy, Norway, UK, Sweden, Switzerland and the USA. The total initial share capital of MIDEC S.A. is Swiss Francs 1m.

The shares allotted in MIDEC to the UK have been taken up by the following manufacturing groups:—Associated Electrical Industries, Limited, British-American Tobacco Company, Limited, Dunlop Rubber Company, Limited, Guest Keen Iron & Steel Company, Limited, Imperial Chemical Industries, Limited, Platt Bros. & Company (Holdings), Limited, Power-Gas Corporation, Limited, Schweppes, Limited, and Standard Telephones & Cables, Limited, in addition to bankers and contractors.

Scots Steelworks Temporary Closure

Between 650 and 700 men will be thrown idle for several weeks as the result of a decision by the Steel Company of Scotland, Limited, to suspend production temporarily from April 19 at their Hallside Works, Cambuslang, near Glasgow. A spokesman for the company said that this step was being taken because of a decline in orders for sections. "The closure is a temporary one, but the date of restart is dependent on the rate of accumulation of orders," he added. "Both the melting shop and the mills are affected, but the steel foundry will continue working as long as possible."

A programme of reconstruction is going on at the works with the object of expanding the production of alloy and special-quality steels.

Foundries in the East Midlands

Since the works of the Stanton Ironworks Company, Limited is the largest group to be visited during the IBF conference in May and it is many years since the plants have been reviewed in the JOURNAL, *both the company's works at Stanton-by-Dale and Asfordby Hill have been given rather extended treatment in this series of descriptions. During the conference, Mr. H. Pinchin of Stanton's Erewash Foundry (one of those to be visited) will present a paper entitled "Some Practical Experiences in Making Moulds in a Mechanized Foundry" and this in many respects will be complementary to the accounts published below.*

(Continued from page 427)

Stanton Ironworks, Company, Limited

The Stanton Company have been prominent as manufacturers of cast-iron pipes for more than 100 years. They were the pioneers in the development of spun-iron pipes in this country and "spun pipes" continue to be their principal product. The company also operates a number of large ironfoundries producing a wide range of castings. Other main products include pig-iron, dry and treated slag, metallurgical coke and related by-products. The company also operate large concrete plants, where the principal products include concrete pipes, pre-stressed concrete pipes for pressure mains, concrete pipe-specials and concrete lighting columns. Major development schemes relating to blast furnaces, gas cleaning and new coke ovens, involving expenditure in the order of £8,500,000 have recently been completed and the sale of purified coke-oven gas has been increased from 6,000,000 to 24,000,00 cub. ft. per day. A further large scheme now in progress comprises a £3,500,000 project for ore preparation and sinter plant.

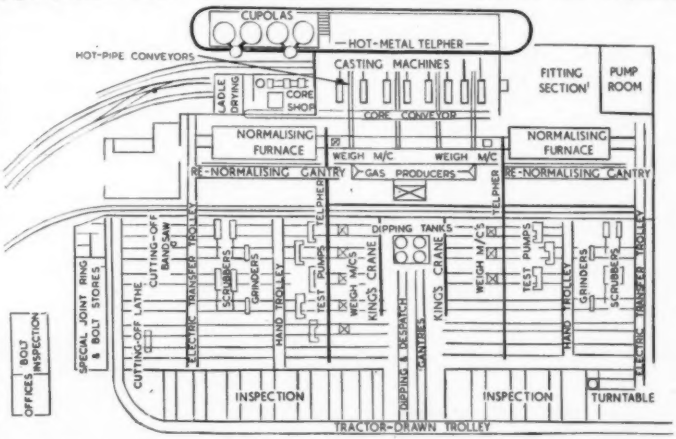


FIG. 1.—*Diagrammatic layout of the Dale spun-pipe plant of the Stanton Ironworks Company, Limited.*

The main works at Stanton and also the Holwell Works near Melton Mowbray are included in the IBF works visits this year, and brief details are as follow:—

Stanton Works

The Stanton Works of the company are situated at Stanton-by-Dale in Derbyshire, some eight miles from Nottingham, and a total of over 6,000 people are employed.

Production of spun-iron pipes, using the De Lavaud system of centrifugal casting, commenced at Stanton in the early 1920's and has continued to be developed throughout the years, and visitors will see the manufacture of these on one of three plants where pressure pipes in all sizes up to 27-in. dia. are produced for the gas and water industries. The method of working in all the spun-pipe plants is basically similar though, of course, the size of pipe produced and output obtained vary considerably—diagrammatic layout of one of the plants is shown in Fig. 1 and a brief description of the process follows:—

Cupola-melted metal is transported from receivers into the casting shops by means of barrel-type ladles carried by overhead telpher cranes running on a continuous track, and each pipe-casting machine in turn receives the required amount of metal for one pipe. A number of telpher cranes and ladles keep up a continuous supply of metal to the casting machines. Each pipe-casting machine consists of a cast-iron water-box, inside which is mounted the alloy-steel pipe mould, which is free to rotate on several sets of rollers driven by a variable-speed motor mounted on the top of the water-box. At each end water-seals are fitted to retain the water in the water-box and the mould is, therefore, completely surrounded by circulating water throughout its length.

The whole assembly is located on a carriage running on an inclined rail bed, which is roughly double the length of the water-box. During the casting operation, the water-box traverses along

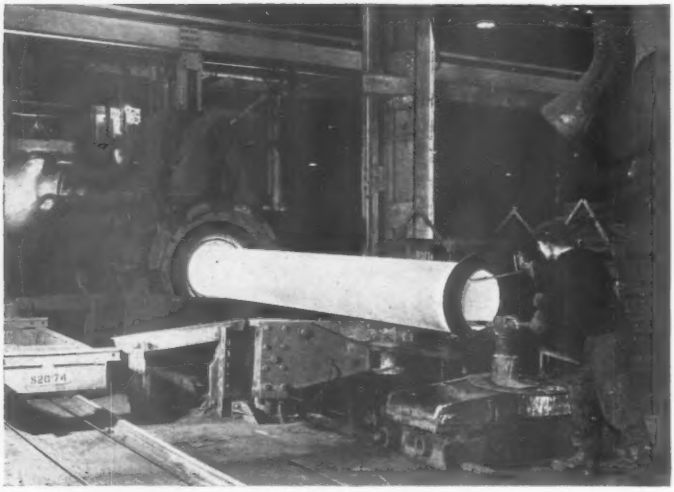


FIG. 2.—*Manufacture of pipes by the centrifugal method. In the view shown, the end of a newly-cast pipe is held in special tongs while the body of the mould moves away on its rails.*

this bed with the mould rotating inside the box at high speed. In pouring a pipe, molten metal is first carried in a long pouring spout to the far end of the mould. Then, as the mould is withdrawn on its rails, molten metal is deposited on the inner surface of the revolving alloy-steel water-cooled mould in the form of a wide spiral band and is held in contact with the mould surface by centrifugal force. Each adjacent band of molten metal knits together to form a sound one-piece tube before the metal freezes. A short oil-sand core, which forms the inside of the pipe socket, is the only core used. Casting is practically continuous and in this way a very high level of production is maintained.

After the pipes have been cast (see Fig. 2), checked and weighed, and after the sand core has been removed from the socket by wire brushing, the pipes (still hot) are engaged by a conveyor chain, the arms of which propel the pipes into and through a normalizing furnace at a controlled speed. These furnaces are designed so that the pipes are heated rapidly to about 880 to 900 deg. C., held at this temperature for some 15 to 20 mins., and then cooled slowly in the furnaces. The pipes next move along gantries for the various finishing operations to be carried out. Each pipe is then hydraulically tested to a pressure of 500 lb. per sq. in. in specially-designed proving pumps (see Fig. 3) and is carefully inspected by experienced personnel to ensure that it is sound, dimensionally accurate, and of good appearance. Pipes are then collected by electric transfer-trolley and fed through a continuous furnace where they are pre-heated to a temperature of 350 deg. F. prior to being immersed in tanks for coating with a patented coal/oil solution.

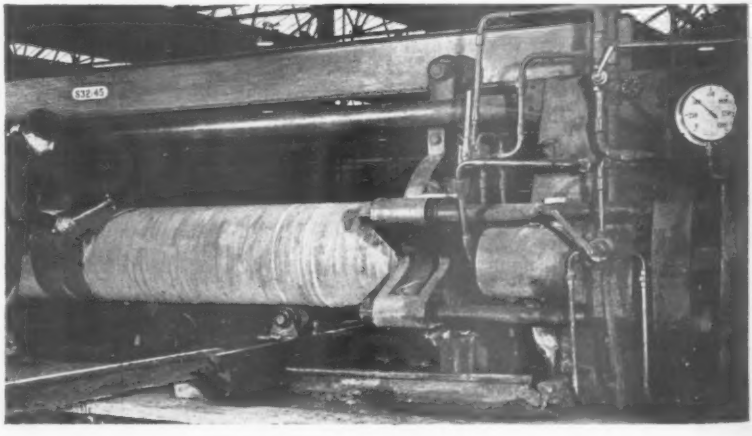


FIG. 3.—*The "business end" of a pressure-testing or proving station for pipe castings. While the pipe is held under pressure of 500 lb. per sq. in. (the pressure depending on the class), it is struck repeated blows with a hammer to test its soundness.*

Mechanized Pipe-fittings Section

It will be appreciated that in addition to the vast output of spun-iron pipes, large quantities of pipe-fittings, joint components for the Stanton flexible pipes and other castings are produced in the Stanton foundries, and visitors will see the production of some of these in one of the large mechanized foundries occupying an area of some 160,000 sq. ft., the layout of which is shown in Fig. 4.

The foundry comprises two independent moulding and casting units with common ancillary departments. The smaller section is mainly concerned with the production of joint components, small-diameter pipe-fittings, etc. These are made

in green-sand on down-draw moulding machines, rammed by means of impellor-type machines, and all moulds are transported through assembly, casting, cooling and knockout stations by means of an air-operated mould conveyor.

The larger section produces pipe-specials up to 24-in. dia. for the gas and water industries for tunnel segments, joint components and manhole frames and covers. Here both down-draw and rollover-type moulding machines are employed. All moulds and the majority of the cores in this section are of green-sand and are carried on bogies which are moved as required by underground "dog"-type conveyors and turntables in a rectangular circuit through assembly, casting, cooling and knockout stations—the latter being of the vibratory type with a grid area of 13 by 7 ft. A unit moulding sand is used for both plants—the treatment and supply plant being capable of handling some 100 tons per hour of prepared sand and delivering it to the moulding machines.

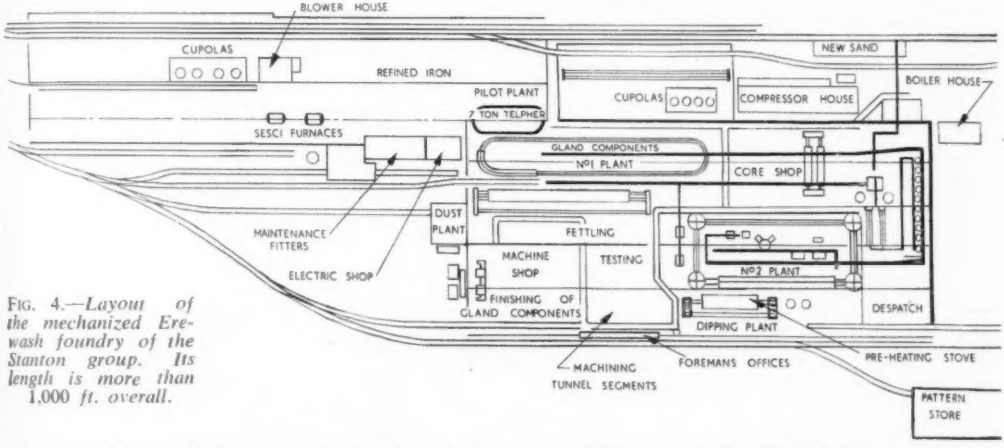


FIG. 4.—*Layout of the mechanized Erewash foundry of the Stanton group. Its length is more than 1,000 ft. overall.*

Hot metal is supplied by a plant comprising four 8 tons per hour mechanically charged cupolas. After "knocking-out," all castings pass through cooling tunnels and are shotblasted before being transferred to the fettling section. They then continue as required through machining, hydraulic testing, air testing, inspection and gauging sections to the pre-heating and coating plant where they are immersed in the patented coal/oil coating solution prior to despatch to customers.

The Stanton company are very proud of their training centre known as "Wilson House" in memory of the late Mr. P. H. Wilson (a past-president of the IBF), and here visitors will be able to see how apprentices from all the various works of the company receive intensive training in their chosen craft; Fig. 5 shows the foundry section of this building.

HOLWELL WORKS

The Holwell Works of the Stanton company, employing a total of 1,600 people, are situated at Asfordby Hill, near Melton Mowbray, and comprise jobbing and mechanized foundries, blast furnaces and slag plants, and engineering shops. Visitors to these works will see a mechanized foundry where large quantities of castings, including standard pipe-specials, railway chairs and base plates, manhole frames and covers are produced.

This plant consists of two almost identical units and it is of interest to note that the first section was installed during the year 1931. Improvements in methods, in design of tackle, and in standards of performance, have been made during the ensuing years but in the main essentials the plant remains the same as when production first commenced and continues to operate very successfully to-day.

All moulds are made on down-draw moulding machines; they are rammed by impellor-type machines, and are transported on compressed-air-driven conveyors through the assembly, casting, cooling and knockout stations—one of which has recently been converted to automatic operation. Each plant is served by its own sand-preparation plant. Molten metal is supplied from a common melting unit comprising three 7-ton and one 4-ton per hour cupolas.

From the knockout stations the castings pass *via* slat conveyors to rotary-table shotblast machines; the cleaned castings are then transferred to slowly-moving slat conveyors for fettling, inspection and gauging prior to hydraulic testing. When required, machining, air testing and coating operations are then carried out prior to the castings being transported to the well-laid-out stockyard illustrated in Fig. 6.

Visitors will also see the production of ingot moulds, ingot-mould bottom-plates, textile cylinders, large-diameter pipe-specials and general castings in the jobbing and specialized foundries at Holwell—ingot moulds and textile cylinders being produced in sections of the foundry specially laid out for this purpose.

Background to the Series

As background to this series of accounts of foundries in the East Midlands grateful acknow-

ledgment is recorded here to the directors and staffs of the various works whose foundries have been described. They have freely provided the special information, drawings and photographs on which the accounts have been based and the respective staffs have been assiduous in checking details and making the data recorded as comprehensive as possible.

Thus, thanks are due to them not only from those who will be visiting the various works during the IBF Buxton conference in May next, but also from that legion of readers here and overseas for whom the accounts have provided such a wonderful cross-section of UK foundry manufacturing operations and facilities.

It is hoped that the series will have fulfilled its objective in presenting a detailed context into which each individual visitor will be able to fit his own immediate impressions.

FIG. 5.—*Part of the foundry section of the Stanton training centre, known as "Wilson House."*

FIG. 6.—*Stockyard, mainly for pipes, pipe-specials and fittings, at Stanton's Holwell Works.*

Overhead Travelling Cranes. Lifting Equipment, Limited, Chittening Estate, Avonmouth, Bristol, have used a 20-page illustrated brochure to describe a range of overhead cranes. There is a picture of the foundry, where the crane, by means of an inverted-V structure running on the tracks, has been given an extra few feet of lift. A picture of a cab-operated crane in an aluminium warehouse merits the attention of makers of industrial clothes-lockers, as it is marred by showing at least half-a-dozen coats hanging on pegs. The range of cranes described is alike varied and interesting.

Suspended-Arch Construction. The Incandescent Heat Company, Limited, Cornwall Road, Smethwick, Birmingham, have used a four-page pamphlet to describe and illustrate the Incandescent-Laclede tile suspended arch for furnace roofs and similar applications. From the first notion of eliminating cement between bricks and cases where bricks are submitted to pressure both of which reduce their melting point—a mechanical system has now been devised which conserves basic principles and provides for simplicity in erection. To effect this a minimum number of interlocking tiles have been designed.

Equipment & Supplies

Internal Strapping and Grinding Machine

A new internal strapping and grinding machine announced by Taylor Tools & Supplies, Limited, of Vortex Works, Atlantic Street, Broadheath, Altrincham, Cheshire, will be of interest to manufacturers concerned with finishing diecastings, plastic mouldings, pressings, small castings, and the like. It can be used for removing flash lines and die lines, and for polishing surfaces inside frames and rings or between adjacent angles (see Fig. 1). It can also be used for light banding operations for the tiny rubber contact wheel will reach into radii as small as ½ in. The machine can be operated vertically as in Fig. 1 or mounted horizontally on a bench. The smallest contact wheel is 1 in. dia. and belts from ¼ in. wide to 2 in. wide can be used without any trouble in maintaining tracking.

Interchangeable contact-wheel heads carrying wheels from 3 in. down to 1 in. dia. can be changed over rapidly as also can the belt. Additional idlers can be fitted on the radius arm to alter the angular disposition of the belt, and the arm itself can be set at various angles to the base of the machine. It is driven by 1 h.p. totally enclosed motor and controlled by a small lever-type starting switch. Metal guards can be supplied, but it is preferable to design these to conform to the class of work or the shape of the workpiece. The abrasive-belt length is 60 in. and it runs at a speed of 4,000 ft. per min.

FIG. 1.—*Internal strapping and grinding machine now being marketed by Taylor Tools and Supplies, Limited, of Altrincham.*

Smoke Density Indicator

A simple indicator has been developed by the fuel research station of the Department of Scientific and Industrial Research to overcome some of the defects of viewers already in existence. Manufactured by the Shandon Scientific Company, Limited, of London, S.W.7, it consists of a special glowing element in the side flue known as the "Glowring." The element is viewed through a column of flue gas from an observation window in the front wall of the flue. The brightness of the Glowring can be adjusted, so that it is obscured when the smoke density corresponds with No. 2 shade on the Ringelmann chart, the maximum density permitted under the Clean Air Act.

New Range of Compressors

A new range of heavy-duty compressors embodying balanced opposed design has been placed on the market by the Consolidated Pneumatic Tool Company, of 232, Dawes Road, London, S.W.6. Known as the "Class FE," the compressors, it is claimed, have outputs up to 5,000 c.f.m. at low pressures and lesser outputs up to 1.4 tons per sq. in. For normal shop use at 100 r.p.m., compressors with outputs from 1,500 c.f.m. to 4,000 c.f.m. can be supplied.

Among the advantages claimed are the small floor area and foundations required and the easy accessibility and vibration reduced by dynamic balancing.

THE WILFLEY MINING MACHINERY COMPANY, LIMITED, of Rushden, Northants, have announced an improvement in the table suspension of their "Wilfley Concentrator," used for the recovery of clean metals from non-ferrous foundry residues. Table friction, it is claimed, has been almost entirely eliminated by the introduction of laminated-steel springs, thus decreasing power consumption and at the same time increasing output. This feature together with the already established self-oiling head motion enables the machine to run for long periods without maintenance. The first of these new machines is being installed by Peglers, Limited, of Doncaster, who have agreed to co-operate with the manufacturers in obtaining data appertaining to performance.

GEORGE COHEN, SONS & COMPANY, LIMITED, of Wood Lane, London, W.12, announce that a new four-ton crane has been added to the range of Jones diesel mechanical models. The KL 44B, as its name implies, is a modification of the KL 44. By modifying the operating speeds of the previous model it has been possible to introduce a less powerful engine while maintaining the same lifting capacity, thus reducing the cost.

STARTRITE ENGINEERING COMPANY, LIMITED, of Gads Hill, Gillingham, Kent, have announced that a ¼-in. capacity sensitive drilling machine has been added to their range of light machine tools. This is the "Mercury" drill, and is available as bench or floor model, with Jacobs chuck and chuck guard supplied as standard equipment.

PANORAMA EQUIPMENT, LIMITED, 29/36, Seymour Mews, Wigmore Street, London, W.1, have announced a new version of their "Panoramette-P.V.C." goggle. This "chemical" goggle, it is claimed, combines the advantages of lightness and strength and is available in various colours. Four specially-designed metal caps fitted into the frame keep out liquids; ventilation is stated to be good, and vision suitably wide.

American Letter

Materials

Copper seems to have reached the bottom of its recession and is resting on approximately a 0.24 cent per lb.* price whilst the supply and demand are acquiring balance. The price of scrap copper has increased moderately, lending support to the prediction that an improvement in demand may be expected partly contributed to by increasing demands of manufacturers in Britain and Europe.

Lead and zinc supplies continue to exceed demand as indicated in Tables 1 and 2. Increasing imports and a decreasing consumption are producing some instability. Table 3 gives an analysis of lead uses in the US. With zinc prices at approximately 10 cents per lb. and lead prices at about 13 cents per lb., Washington sources are proposing a four cent import tax on these materials as the Trade Agreements Acts come up for reappraisal. Price paril points of 17 cents for lead and 14.50 cents for zinc are proposed as providing the best long-range solution to the prevailing problem in the industry.

In step with the reduction in copper output, the mines of the International Nickel Company have reduced nickel production by 10 per cent. to adjust to a reduction in demand. Wtih this reduction, a labour force of 16,000 men in the Sudbury area was reduced by approximately 1,000 men. Meanwhile, developments involving expenditures of more than £21,000,000 at the new ore bodies in Canada slated for production in 1960 are continuing.

TABLE 1.—*Zinc Supply and Demand in the USA.*

	1957 (estimated).	1956 (approximate).
	Long tons.	Long tons.
Supply:		
Smelter production	940,130	946,070
Metal imports	267,000	212,050
	1,194,300	1,164,120
Less: Exports	9,790	8,010
Consumption by industries:		
Galvanizing	323,000	430,080
Die-casting	333,750	320,400
Brass mills	97,900	110,360
Rolled zinc	36,490	41,830
Oxide	18,690	16,910
Other	22,250	17,800
Surplus	365,790	218,100

TABLE 2.—*Lead Supply and Demand in the USA.*

—	1957 (estimated).	1956 (approximate).
	Long tons.	Long tons.
Supply:		
Mine production	298,150	317,543
Secondary production	436,100	450,952
Imports:		
Ore, matte, etc.	182,450	164,832
Pigs and bars	271,450	234,762
	1,188,150	1,163,671
Changes in stocks at smelters	22,250	7,508
Approximate total available	1 165,900	1,166,162
Demand:		
Industrial consumption	1,001,150	1,077,648
Consumers and secondary smelters stocks	4,450	7,057
For stockpile and unaccounted for	160,200	96,572

TABLE 3.—*Lead Uses in the USA.*†

	1957 (estimated).	1956 (approximate).
	Long tons.	Long tons.
White lead	15,130	15,085
Red lead and litharge	66,840	70,497
Storage batteries	333,750	329,986
Cable	102,350	118,561
Building	45,390	51,866
Tetraethyl lead	153,970	160,871
Ammunition	37,380	39,554
Foil	4,450	4,087
Bearing metal	23,140	25,205
Solder	64,080	67,008
Type metal	22,250	23,771
Caulking lead	57,850	57,823
Other uses	82,770	104,343

† Based on US Bureau of Mines statistics.

* One cent (USA) = approximately 0·853d.

Technical Conferences

The programme of the 11th Annual College/Industry Conference of the Foundry Educational Foundation, held in the Hotel Statler, Cleveland, Ohio, March 12-13, included a number of discussions and reports which will be of interest to foundrymen in this country. Among the discussions were "Engineering Education in Cast Metals for the Future," and one devoted to the need for an expanded Foundry Educational Foundation to meet modern trends.

Mr. C. J. Freund, Dean of the College of Engineering, University of Detroit, spoke on "The Foundry Industry's Needs—from Craftsmen to Scientist" and Dr. Clyde E. Williams, president of Clyde E. Williams and Company, gave an address on "The Foundry Industry in the New Technological Age."

The Nuclear Engineering and Science Conference of the 1958 Nuclear Congress was held in March in Chicago. It was the fourth of its kind and was sponsored by the American Nuclear Society and more than 30 additional engineering and scientific societies of which the American Society of American Engineers was one. A large number of technical papers were presented, none of which, however, dealt directly with foundry topics.

The 13th Annual Management Engineering Conference will take place in New York, April 24-25. It is sponsored by the Society for the Advancement of Management and the management division of the American Society of Mechanical Engineers. The several sessions held, dealt for the most part generally with managerial problems and methods engineering.

British Safety Council's Report

The British Safety Council are distributing to factories throughout the country posters which emphasize the need to scrap worn out and damaged hand tools. The Council's recent report assesses the number of minor injuries caused by unserviceable hand tools at around 500,000 a year and the posters are part of a campaign to reduce this high figure.

Ministry of Labour figures put the figure much lower, at 14,516, but the Council claim that this is misleading because it does not include cases where the worker was incapacitated for any period less than three days. The point is made that absences of even a few hours add up, over a year, to many man days. The new report was submitted to the National Union of Manufacturers whose president, Mr. Garland, said the minor accident figure was by no means unexpected to him and that too few manufacturers realized the high cost of even a cut finger.

Platelayers and Fishplates

The origin of the words platelayer and fishplate is of great interest because to most men, railways have a permanent fascination in spite of the development of newer methods of transport. The first "railways" were made of wooden rails, usually of beech or oak, a few inches wide, held to a standard distance by crossbeams or "sleepers." This was done to avoid the wear of the horse-drawn tram-wheels—which had no flanges—upon ordinary road surfaces and such railways considerably increased the loads carried.

Lord Keeper North in 1676 recorded that "the manner of the carriage is by laying rails of timber exactly straight and parallel and bulky carts are made with four rowlets (wheels or rollers) fitting these rails, whereby one horse will draw down four or five chaldrons (approximately 10½ to 13 tons each) of coals."

To add to the life of such "railways," plates of iron were nailed on to them but, with the introduction of iron wheels in 1734, much buckling and wear took place. Already the use of such a device had given rise to the name "platelayer" for the craftsman who fitted these iron plates and the word is in use to this day to describe the man who works on the laying and maintenance of the rails on the permanent way. Plate rails were next turned up into an L-section so as to hold in plain-rimmed wheels, the first of such rails being laid in 1789 between Loughborough and Nanpantan. But this method of rail-making caused difficulties at switch points and at level crossings. Thus the next step was to flange the wheels themselves, and this development in its turn affected the type of rails put down.

Later Evolution

The new type of plate rails were placed on their edges rather than on the flat and these were at first cast in three-foot lengths in a double-flanged section and, for the sake of strength, each rail section was made narrower at the two ends and deeper or "fish-bellied" in the middle. These rails were then bolted together end-to-end by narrow joining plates; hence the term "fish-plates," a word still used to describe the pieces used to link up modern long, bulbnosed steel rails.

These developments were largely the work of William Jessop of the Butterley Iron Works, near Derby. In 1800 he devised a longer rail and its fixing by cast iron "chairs" to the sleepers. He proposed at first to flange the wheels so that the flanges came on the outer side of the rails which were set at a distance of five feet apart. The outside flange was soon found to have several disadvantages in practice; a serious one being the tendency of the wheel to be forced off the axle when the train was under strain on the curves. By putting the flanges on the inner sides of the wheels difficulties such as this were overcome, but the new method meant that the gauge of five feet became shortened by the width of two rails, that is to 4 ft. 8½ in. Hence arose the "standard" gauge of British railways.

Iron from Outer Space

Some of the very earliest iron implements contain a high percentage of nickel and this suggests that they were made from meteoric iron. The search for such iron no doubt resulted in the finding of iron ores which could be worked into a malleable metal.

The vast majority of meteors falling on to the earth from outer space are burned up by the friction of the earth's atmosphere and are thus seen as only "shooting stars." It has been estimated that over 400 million of these fall into the gravitational sphere of the earth every year but almost all of them are consumed into dust and gases long before they reach the earth's surface. There have, however, been notable exceptions.

One fell in 1876 at Rowton in Shropshire and weighs 56 lb. It is now at the South Kensington Museum. One brought from Greenland by the Arctic explorer, Commander Peary, weighs over 36 tons and is about 11 by 7 by 5 ft. in size. This was one of three huge meteorites discovered there. But one that fell at Meteor Crater in Arizona nearly 5,000 years ago made a hollow nearly a mile across and 500 ft. deep. The actual meteor lies 1,300 ft. below that and has been reached by rock drills.

In recent times a meteor about one-hundredth the size of the Arizona meteor caused colossal damage when, in 1908, it fell in Siberia. As it struck the ground, a column of fire and smoke rose to the height of over 12 miles and the forest for 400 square miles around was destroyed. The meteor killed nearly 2,000 reindeer and many families of peasants were wiped out.

Blast and fire from this meteor affected over 80 million trees over an area of 2,000 square miles. The shock was felt in Britain, 3,500 miles away, and at Irkutsk, 1,000 miles off, continuous earthquake tremors were recorded for over an hour after the meteor had fallen.

"Shooting Stars"

At what times meteors are likely to occur is difficult to predict. At certain periods, however, the earth passes through swarms of meteors which circle round the sun in an orbit. When this happens the displays of "shooting stars" are most in evidence. For example, on November 13, 1833, there was an impressive display when nearly a quarter of a million meteors were observed. Humbolt, the scientist, recalled then that he had seen a similar display about 33 years before.

A theory was therefore put forward that the earth crossed the main path of these particular meteors once every 33 years, and in 1866 this occurred again giving a display of great brilliance. But in 1899 nothing like this happened. Perhaps the stream was exhausted or, more likely, the attraction of the great planet Jupiter had diverted it from its course. Nowadays, meteors appear to be mainly erratics and some of these no doubt have given rise to accounts of "unidentified objects."

Publications Received

Cornish Engineers, by Bernard Hollowood. Published by Holman Brothers, Limited, Camborne.

This excellently reproduced book, whilst concentrating on the history of the 150-year-old firm of Holman Brothers, gives a general picture of the development of engineering in Cornwall. It is true to say that five generations have made an outstanding contribution to this development. The firm was started in 1801 by Nicholas Holman operating as a boilersmith, but with the passage of time, the nature of the business changed. An early change was to take on the manufacture of rock drills, which is still amongst the firm's major activities. Making of pneumatic tools was then perhaps a normal sequence, as was also the making of air-compressors. If, in A.D. 2058, a historian resorts to this book for to-day's statistics he will be disappointed at not finding recorded the numbers of employees at present engaged in the works; this, to our mind, is a major omission. It is realized that Holman Brothers is a huge concern with great overseas connections, but whether 1,000 or 15,000 are employed we are not told. The book is very readable in spite of a certain amount of repetition.

Accidents, Vol. 34, No. 1. Published for the Ministry of Labour and National Service—H.M. Factory Inspectorate—by Her Majesty's Stationery Office, York House, Kingsway, London, W.C.2; price 1s. 3d. net.

Whilst, happily, there are no actual foundry accidents dealt with in this issue, there are plenty of others reported which could have occurred in foundries. There is, for instance, the case of a coke-screening belt, where a workman hearing a squeak thought the pulley bearings were running hot. In attempting to find out if this was the cause, he put his hand on one of the pulley bearings, slipped, and became entangled between the belt and the pulley. Two gruesome pictures illustrate the accident. Another blood-curdling picture shows a work girl in mid-air with her hair caught on a hook, suspended from an overhead chain convevor. Since the accident the hooks have been turned through a right angle.

Review of Progress, 1957—Report for Employees. Issued by the United Steel Companies, Limited, 17 Westbourne Road, Sheffield, 10.

The character of this annual publication changes from year to year. Gone is the piece of cake showing how the money went and no longer are there pictures of individuals on the staff. Instead, there is a dignified statement of the business done during 1957 and a succinct account of the competition to be met with this year. This survey is so good that it is worthy of a greater circulation than just to the employees of the "Companies."

Bulletin and Foundry Abstracts, Vol 14, No. 5. Published by the British Cast Iron Research Association, Alvechurch, Birmingham.

This issue contains a most useful article on "Foundry Education Abroad," by D. S. Drake, covering the United States, France, Germany, and to a lesser extent, Belgium, Denmark and Holland. It contains information which should be absorbed by the dozens of individuals sitting on education committees throughout the foundry industry. The dividing line between the foreman and the technologist is everywhere obvious, except, of course, in the United States.

Specifications for Aluminium and Aluminium-alloy Products. Issued by the Northern Aluminium Company, Limited, Bush House, Aldwych, London, W.C.2.

It is an interesting commentary that 108 pages are necessary to list in tabular form all the specifications for aluminium and its alloys; for castings alone, there are no fewer than 40! To have these nicely presented in a spiral-bound cover is indeed a worthwhile service and the issuing house is to be congratulated. Included is a list of proprietary brands of alloys and their suppliers. The book is excellently indexed for quick reference.

Everybody's Guide to National Insurance. Published for the Ministry of Pensions and National Insurance by Her Majesty's Stationery Office, York House, Kingsway, London, W.C.2; price 6d. net.

This 34-page pamphlet, in simple language, outlines the vast system of national insurance. It details the amounts of the weekly premiums to be paid and the multitudinous benefits they cover. It is just as well to know exactly what one gets for the yearly premium of £45 10s. a year.

House Organs

600 Magazine, Vol. 32, No. 141; issued by the George Cohen 600 Group, Limited, 600, Wood Lane, London, W.12.

Mr. Frank Rowe, whose erudite articles on wine have been so much appreciated by the foundry industry, turns his attention in this issue to cheese, a food largely unappreciated in this country. His comments make very interesting reading. An outstanding feature of this magazine is the reproduction in colour of photographs taken by Mr. Percy R. Levy, and the one of the Lac des Cygnes in the current issue ranks amongst his best efforts.

Carron Cupola, Vol. IX, No. 1; issued by the Carron Company, Falkirk.

This issue carries a double-page spread of excellent sketches made by the manager, Mr. E. J. Leaver, during a business trip to South Africa. The "manager" of the Carron Company is quite different from other concerns, as the firm operates under a Royal Charter, and so this post apparently replaces the managing director. This issue reports the appointment of Mr. J. Logan, L.I.M., as manager of the Low Foundry in addition to that of the Mungal shops.

Enchiridion, Vol. 1, No. 12. Published by Firth Vickers Stainless Steels, Limited, Sheffield.

On page seven of this issue there is an example of good colour printing, showing examples of Danish tableware made from enamelled stainless steel—it would apear to the reviewer to be a case of "gilding the lily." This attractively produced 16-page well-illustrated magazine is devoted to showing stainless steel in action which it does very effectively.

Sif-Tips, Vol. 24, No. 101. Issued by the Suffolk Iron Foundry (1920) Limited, Stowmarket, Suffolk.

This issue contains a useful article by "Will the Welder" in the making of a muffle for preheating castings prior to welding. Naturally enough, welding is itself used in its construction. A gas burner has been chosen as a method of heating.

Notes from the Branches

Slough Section

The 1957/58 technical session of the Slough section of the Institute of British Foundrymen concluded on March 18 with the annual general meeting held in the lecture theatre of High Duty Alloys, Limited. The preliminary business of the evening was the election of officers for the next session, when it was decided that Mr. P. Hoesli is to be president and Mr. S. J. Williams and Mr. H. J. Proffitt senior and junior vice-presidents respectively. Mr. J. Wood then thanked the retiring president, Mr. A. R. Parkes, for the time and unceasing effort he had put into his duties and commented that Mr. Parkes had in fact made section history in holding this office for the two consecutive years. He concluded by saying that one item on the agenda which must receive mention was the thanks of the section to the management of High Duty Alloys, Limited, for placing the lecture theatre and other facilities at their disposal.

Non-destructive Testing

Following the formal business of the evening, Mr. S. L. Fry, of J. Stone & Company (Charlton), Limited, presented a paper entitled "Non-destructive Testing of Castings." As an introduction, Mr. Fry gave a brief description of the methods used in the testing of castings, bringing members up-to-date with the latest techniques. He said that the methods mainly used in non-destructive testing were (*a*) visual inspection, (*b*) liquid penetration, (*c*) pressure testing, (*d*) ultrasonic testing, and (*e*) radiographic examination. The author gave some details of all these methods but emphasized the growing use of radiographic inspection as, he said, he considered this was the method for giving the greatest range of information. In giving details of the types of X-ray sets used for this work, Mr. Fry tabulated the various powers for given types of thicknesses of metals, and pointed out that the shorter the wave-length of the rays the greater was the penetration. Typical of the metals and thicknesses of section which can be revealed, he quoted the range covered by one 250 k.v. X-ray set which he said is capable of penetrating either 9 in. of magnesium, 7 in. of aluminium, or 2 in. of bronze. Radio-isotopes could be used as an alternative to X-rays, but for some purposes this alternative was not as good as an X-ray set of equivalent power, although more portable.

Mr. Fry concluded his paper with a very comprehensive collection of radiographs and colour transparencies of defects appearing in castings, giving details of the cause and methods used for eliminating the trouble and answering members' questions as each slide was shown. He showed a very wide knowledge of the subject and this was referred to by Mr. J. Wood in proposing the vote of thanks. Both the paper and the collection of slides, Mr. Wood felt, were unsurpassed by any he had seen previously and Mr. Parkes, before closing the meeting, heartily endorsed these remarks.

Beds & Herts Section

A most successful works visit took place on March 14 when some 75 members of the Beds/Herts section of the London branch paid an evening visit to the works of Foundry Equipment, Limited, Leighton Buzzard. A special purpose was to see a "mock-up" of the firm's stand at the forthcoming foundry exhibition in Cleveland, USA. The party arrived at about 7.30 p.m. and was shown the working exhibits on the stand, erected in the firm's structural shop. Next, the visitors were shown round the foundry, machine and assembly shops and saw, *inter alia*, the manufacture of valves and overhead segmental wire-rope conveyors in operation. The whole programme was well organized and by 9 p.m. all the visitors were assembled in the buffet where refreshments were very much enjoyed. A measure of the evening's success can be gained from the fact that the gathering of foundrymen did not break up until almost 10.45 p.m.

Sheffield

The Sheffield branch, which celebrates its golden jubilee in May, held its annual dance at the Brincliffe Hall, Sheffield, on Friday, March 28. Nearly 250 members and their ladies were present. It was agreed by all present that this function formed a very agreeable complement to the members' dinner held on January 27, and reflected great credit on the organizers.

BRITISH STRADDLE CARRIER COMPANY, LIMITED—Col. R. T. Hartmann has resigned from the board, and has ended his assocation with the company.

JOHN LYSAGHT, LIMITED—Mr. A. F. Gadsby has been appointed a director of the company. He is also a director of the parent company of Guest, Keen & Nettlefolds, Limited.

FIG. 1.—*Members of the Beds/Herts section of the IBF inspecting stand exhibits at the works of Foundry Equipment, Limited, Leighton Buzzard. (Photograph taken from one of the overhead gangways.)*

Company News

Treasury consent has been given to a £260,000 convertible unsecured loan stock issue by the UNIVERSAL ASBESTOS MANUFACTURING COMPANY, LIMITED, to meet the cost of developments planned for the current year and to provide additional working capital. Preference shareholders are being asked to agree to an alteration of articles so that their consent will no longer be required to any issue of debentures. The preference rights will be improved and it is proposed that the dividend rate be increased from 4½ to 5½ per cent.

Profits so far this year show a marked improvement over the comparable period last year, states the chairman, Mr. F. W. R. Douglas. At the year-end, September 29, 1957, the net current asset position had dropped by £154,404 to £522,314. Group profit before tax was £201,358 (£340,135).

TUBE INVESTMENTS, LIMITED—The company has decided to declare unconditional its amendment offer to the shareholders of the Sun Cycle & Fittings Company, Limited. Acceptances have been received from holders of 91.5 per cent. of the preference and 86.3 per cent. of the ordinary shares.

CROFTS ENGINEERS (HOLDINGS), LIMITED—Trading profit in 1957 expanded from £1,168,302 to £1,369,646, and the dividend on the £2,000,000 ordinary capital is raised from 12½ per cent. to 15 per cent., with a final of 8¾ per cent., against 7½ per cent. After taxation of £714,273 (£597,514), the net profit is up from £570,788 to £655,373.

BARR & STROUD, LIMITED, scientific instrument makers, of Glasgow—The ordinary dividend of the company for 1957 is increased to 8 per cent. from 7½ per cent. for 1956. However, no special bonus is to be paid this time, against 1 per cent., tax free. Profits are £44,657 (£50,946), after tax of £86,951 (£72,961) and transfer to reserve for additional depreciation of £29,000 (£23,000).

G. & J. WEIR, LIMITED, engineers and founders, of Glasgow—A final dividend of 12½ per cent., making 16 per cent. for the year, on capital increased by a 100 per cent. scrip issue (30 per cent. on the old capital), has been recommended. Consolidated group surplus, after taxation, etc., amounts to £981,204 (£1,401,414). and the profit of the parent company is £707,804 (£964,436). Allocation to reserve is £369,349 (£600,000).

C. A. PARSONS & COMPANY, LIMITED—A final dividend of 3½ per cent. makes a total of 7½ per cent. for 1957 on the £9,000,000 ordinary shares. On account of 1956 there was an interim of 4¼ per cent. paid on £3,600,000 and a final of 3¼ per cent. on the present capital as increased by a rights offer and a one-for-two scrip issue. A net profit of £1,996,714 for the year compares with £2,293.264, after tax of £1,996,000 (£1,941,000), providing £80,000 (£15,000) for contingencies.

MASSEY-FERGUSON (GREAT BRITAIN), LIMITED—Trading profit of the company, until recently known as Massey-Harris-Ferguson (Great Britain), amounted to £3,031,822 (£745,097) for the year to October 31, 1957. During the year the company acquired Massey-Harris-Ferguson (Sales), Limited. With interest income, and after charging depreciation, tax, etc., the profit balance was £1,402,727 (£271,861). The ordinary dividend, free of tax, paid to the parent concern, was £1,397,500 (£133.000). The balance carried forward is £1,844,481 (£1,771,984, after transferring £543,251 from tax reserve).

Forthcoming Events

APRIL 23

Institute of British Foundrymen

Birmingham branch : Annual general meeting, followed by "Cupola Developments," by G. J. Shaw, B.SC., PH.D., 7.15 p.m., at the James Watt Memorial Institute, Great Charles Street.

London branch : Annual general meeting followed by Short Paper Competition, open to members of all branches, 7 p.m., at the Constitutional Club, Northumberland Avenue, W.C.2.

Southampton section : Annual general meeting followed by lecture and film "Modern Malleable," 7.30 p.m., at the Technical College, St. Mary's Street.

Combustion Engineering Association

Midland region : Meeting at the Birmingham Exchange and Engineering Centre commencing 10.30 a.m. until approximately 4.30 p.m. Morning session: Films—"Conveyors your Servants," and "The Seed is Sown." Afternoon, 2.30 p.m.: "Industrial Use of Coke," by E. Murphy.

Institution of Mechanical Engineers

Education group: Discussion—"Teaching the Fundamentals of Automatic Control." 6 p.m., at 1, Birdcage Walk, Westminster, London, S.W.1.

APRIL 24

Institute of British Foundrymen

Stoke-on-Trent section: "Cupolas," by C. A. Payne, 7.30 p.m., at the Town Hall, Hanley.

APRIL 25

Institute of British Foundrymen

Slough section : Social evening—visit to the BOAC workshops at London Airport, followed by dinner in one of the passenger restaurants. Coach will leave Slough Social Centre at 6 p.m.

APRIL 26

Institute of British Foundrymen

Bristol & West of England branch : Annual general meeting, 3 p.m., at the Grand Hotel, Bristol.

East Midlands branch : Annual general meeting and election of officers, 6 p.m., at the College of Arts, Derby.

Lancashire branch : Annual general meeting, presentation of John Wilkinson Memorial Medal and winning paper, and technical film show, 3 p.m., at the Midland Hotel, Manchester.

Recent Wills

CARTER, G. T., chairman and secretary of Thomas Staniforth & Company, Limited, manufacturers of hand tools, of Harkenthorpe, near Sheffield ... £13,933

ROSE, A. G., controlling director of Rose Bros. (Gainsborough), Limited, engineers and manufacturers of wrapping and packing machines, of Gainsborough (Lincs) £197,219

SLATER, LEONARD, chairman and joint managing director of George Slater, Limited, iron and steel scrap merchants, of Sheffield, and former motor-cycle racing competitor £34,405

BOND, J. A., technical assistant and deputy to the works manager (iron) at the Scunthorpe works of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited) £9,726

GRIFFITHS, A. E., founder and chairman of A. E. Griffiths (Smethwick), Limited, industrial oven builders, etc., and chairman of Modern Furnaces & Stoves, Limited, Handsworth, Birmingham ... £101,765

INTESTATE

TURNER, H. G. W., for the past 17 years with the Dowty Group, Limited, Cheltenham, recently as paymaster to Dowty Fuel Systems, Limited ... £1,284

NEWTON, CHAMBERS & COMPANY, LIMITED—Col. R. P. W. Adeane and Mr. J. G. MacLachlan have joined the board. Col. Adeane is chairman of Ransomes & Rapier, Limited, and Mr. MacLachlan is also a director. They have joined in accordance with the terms of the recent merger.

News in Brief

THE MEMBERSHIP of the American Foundrymen's Society is now 13,340—a record figure.

ANTONIO RICHARDSON, LIMITED, ironfounders, Victoria Street, Mansfield, Notts, has had plans prepared for the erection of a moulding shop in Victoria Street.

MR. ALBERT VICTOR SMITH, a steel worker in the ingot department of Thos. W. Ward, Limited, Sheffield, was killed in an accident recently when he was struck by a mobile crane.

E. H. JONES (MACHINE TOOLS), LIMITED, announce the completion of their new premises at Edgware, and their London area address is now 48, High Street, Edgware (telephone: Edgware 4488/9).

PRODUCTION of French steel in February totalled 1,183,000 tons and pig-iron 947,000 tons. This is a decline compared with January, owing to fewer working days and floods in the Lorraine region.

AN ADDITIONAL FACTORY—their fifth—has been acquired in the Slough Trading Estate by Wolf Electric Tools, Limited, London. The new premises will make available an extra 15,350 sq. ft. of floor space and are to be used for promoting planned technical developments.

THREE WORKERS at Hadfields, Limited, the Sheffield steelmakers, have retired after being at the works for a total of 138 years. They are Miss Emily Liversidge, who has been a cleaner with the firm for 56 years, Mr. Jack Earnshaw, a labourer for 52 years, and Mr. Jack Limb, a slinger for 30 years.

ONE HUNDRED AND FIFTY workers at the Scotswood engineering works of Aveling-Barford, Limited, have been told they will become redundant in July at the present factory, but that they will be offered jobs at the company's works at Grantham. The reason was stated to be a reorganization of production.

A WARRANT has been granted by Greenock Dean of Guild Court to Scotts' Shipbuilding & Engineering Company, Limited, Greenock, to erect a new boilershop, estimated to cost £54,000. The building, of steel-framed construction, will measure 159 ft. by 69 ft. A new railway line is to be built for the works.

GAINSBOROUGH URBAN COUNCIL were told on April 8 that negotiations were going on with Abrafact, Limited, grinding wheel manufacturers, Beulah Road, Owlerton, Sheffield, for the establishment of a factory on land in Bridge Street, Gainsborough. The area has been cleared under a slum-clearance and road-widening scheme.

THE GLASGOW FIRM of British Chrome & Chemicals, Limited, is to pay off 120 of its workers owing to fewer orders. The dismissal notices will be issued in a week's time—but it is still to be decided which of the 650 employees will be affected. A new factory is to be built next to the existing Shawfield Works which it will replace.

SKETCH PLANS of the new £840,000 Falkirk technical college, which will incorporate some of the most modern technological features yet available in Scotland, have been approved by Stirlingshire Education Committee. The college will cover ten acres off the Falkirk-Grangemouth road. Building is expected to start not later than May of next year.

SHAW MOISTURE METERS, 31, Market Street, Bradford, have been appointed as sole British agents for K. P. Mundinger, Germany's leading moisture-meter manufacturers. The combined ranges of both firms, totalling 40 instruments, are on show at the Instruments, Electronics and Automation Exhibition, currently being held at Olympia, London—closing date April 25.

PRODUCTION CHEMICALS (ROCHDALE), LIMITED, Victoria Buildings, 32, Deansgate, Manchester, 3, have issue a data sheet covering, by means of graphs, the fineness gradings of four olivine sands, together with analyses showing the percentages both as compounds and minerals. As a foundry material its importance warrants a scrutiny of these properties by all foundry metallurgists.

TAYLOR'S FOUNDRY AT LOUGHBOROUGH, has made the two new bells which have been presented by over 200 United States airmen, who have been stationed at Lakenheath, Suffolk, to the village church in Eriswell, near the airfield. One bell is inscribed, "Americans gave me, John Taylor made me." On the other are the words, "May God protect the men that fly. May Anglo-American friendship never die."

AFTER 31 YEARS OF TRADING Mr. H. Landseer-Bailey, Lanmetalle Works, Willow Lane, Mitcham, Surrey, has decided to carry on his business as a private limited liability company. The new company, styled H. Landseer-Bailey, Limited, was registered on March 17, and the directorate consists of Mr. H. Landseer-Bailey (chairman), Mr. Robert John Allen, Mr. Edward Henry Drew, and Mr. Francis Wilfred Bailey.

MACLEAN & COMPANY (METAL WINDOWS), LIMITED, Hamilton, has merged its interests with the Standard Metal Window Company, West Bromwich (Staffs), and will be known in future as Standard Maclean, Limited. The West Bromwich plant has closed down, concentrating the work at Hamilton. The general manager of the Hamilton firm said that it was possible that it would employ additional workers locally. The board of directors remains unchanged.

Mr. A. V. PERRY, chairman of Clayton Dewandre Company, Limited, vehicle-equipment manufacturers, Lincoln, states in a report, that there is a tendency for shorter order books and a diminution in demand. He considers that the year 1958 is not likely to be an easy one for industry generally, he adds, however, that the company's prospects in 1959 already look brighter. New products for which the firm is tooling will come into production in a year and the demand is assured.

AT THE SECOND INTERNATIONAL EXHIBITION of the Peaceful Uses of Atomic Energy, which will be held concurrently with the United Nations Atomic Energy Conference at Geneva next September, Britain will play a leading part. The Nuclear Energy Trade Association's Conference which is responsible for co-ordinating the British effort, has reserved more than 40,000 sq. ft. of floor space at the *Palais des Expositions*—a larger area than has been set aside for any other country.

Mr. K. E. WALKER, assistant managing director of the engineering division of Newton Chambers & Company, Limited, Thorncliffe, Sheffield, presented awards to members of the Thorncliffe Motor Club, of which he is president, at their third annual dinner/dance, at Barnsley on April 11. He said that the club's membership was now 131, and paid tribute to the work of the officials. He also presented a gift to the club secretary, Mrs. M. Kemp, for her work, and as a belated wedding present.

TWO SHEFFIELD MEN ESCAPED INJURY when fire broke out in a 500-gallon oil vat at the Sheffield works of

News in Brief

English Steel Corporation, Limited, on April 11. They were both able to dash for safety. The men had been dismantling oil-feed pipes to the disused vat when their oxy-acetylene burners ignited gas trapped in the pipe. Flames, shooting 100 ft. high, melted plastics windows in the roof. Sheffield Fire Brigade got the outbreak under control by spraying foam into the tank and production is not affected.

A SURVEY OF SHEFFIELD to find buildings of historical or architectural interest and provide a permanent record has been organized by the Council for the Conservation of Sheffield Antiquities, with the co-operation of Sheffield, South Yorkshire and District Society of Architects and Surveyors, and the Hunter Archæological Society of Sheffield. The aim is to provide a complete record and to recommend additional buildings for inclusion in the Ministry of Housing and Local Government's schedule.

THE LEGAL GROUNDWORK necessary to industrial managers and executives is to be covered in a three-day course on industrial and factory law, to be given on May 6, 7 and 8, by Mr. Harry Samuels, M.A., barrister-at-law, under the auspices of the Industrial Welfare Society. The course, which will be held at the Society's headquarters, Robert Hyde House, 48, Bryanston Square, London, W.1, is completely up-to-date with the latest changes in legislation, and therefore also serves as a refresher for executives who have not considered the subject for some time.

Mr. GEORGE WILSON, chairman and managing director of Raleigh Industries, Limited, Nottingham, presented the awards at the firm's thirteenth annual prize distribution on April 11, when almost £500 was presented to 98 young employees who have taken part in the firm's further education scheme. He said, "We are delighted to spend money in this way. I am sure it will bring much benefit to this company." This year there was a 13 per cent. increase in the number of awards with £115 more in prizes. Mr. D. D. J. Pollock won the premier award of £20.

CONSTRUCTION OF THE FIRST 12 heat-exchangers for the Bradwell nuclear power station is nearing completion at the Thornaby Works of Head, Wrightson & Company, Limited. The exchangers, fabricated in $1\frac{9}{16}$-in. thick steel plate, are 95-ft. long, 20-in. dia., and weigh over 200 tons. When the first exchanger is completed in May it will be launched into the river Tees from Head Wrightson's slipway and towed around the coast to Bradwell at the mouth of the Blackwater Estuary in Essex. It is believed that this method of transportation has not before been adopted for equipment of this type.

RECOVERY TO FULL PRODUCTION is reported by Griffin & George (Laboratory Construction), Limited, which suffered the loss, by fire, of its Birmingham joinery works during the night of February 25. Following salvage operations, the company secured the use of workshop facilities which enabled them to give effective employment to some 50 of their skilled bench workers and by "feeding" machined parts provided by friends in the industry, production was revived within one week. A complete transfer has now been made to more commodious premises at Walsall Road, Perry Barr, Birmingham, 22B, and the whole of the personnel is again operating under one roof.

HEPWORTH & GRANDAGE, LIMITED—Mr. Bernard McMahon has retired from the board.

Exhibition Briefs

Instruments, Electronics and Automation

The 1958 Instruments, Electronics and Automation Exhibition which is being held at Olympia from April 16 to 25 has this year been sponsored by six trade associations. Times of opening for the exhibition are 10 a.m.-6 p.m. except on April 18 and 23 when it will be open from 10 a.m. to 9 p.m.

FIRTH CLEVELAND INSTRUMENTS, LIMITED, of Treforest, Glamorgan, are exhibiting a wide range of field handling instruments, valves, nuts and clips.

THE BRITISH ROTOTHERM COMPANY, LIMITED, Merton Abbey, London, S.W.19, are exhibiting (*Stand* 932) a comprehensive range of dial thermometers, recorders and controllers, including bi-metal instruments, mercury-in-steel thermometers, vapour-pressure thermometers, temperature and pressure recorders, and pressure, vacuum, altitude and hydraulic gauges.

SIEMENS EDISON SWAN, LIMITED, of London, are exhibiting (*Stand* 308) many new components from a wide selection of radio and electronic components and fluorocarbons. The "Industrial Servo" unit which is being exhibited is completely self-contained. Incorporating a D.C. amplifier, it provides a complete position and speed-control servo system, and its applications include high-accuracy controlled speed drives and follower systems.

THE MORGAN CRUCIBLE COMPANY, LIMITED, of Battersea Church Road, London (*Stand* 414), are displaying a selection from their range of products which have application to industry. Morganite Resistors, Limited, are showing their range of recently developed, and established, radio component products. Also supporting the parent company is Morgan Refractories, Limited, showing among its range pure oxide ware, large crystallized alumina and mullite tubes and sheaths.

HONEYWELL-BROWN, LIMITED, of Perivale, Greenford, Middlesex (*Stand* 407) are showing a range of instruments and automatic controls, electronic and otherwise. New products are to be seen functioning alongside established instruments in simple and complex control systems. The display includes complete control systems; furnace temperature; flow ratios for furnace combustion; flow, liquid level and pressure in a fractionating column. Also on show are non-indicating control systems for simple or low-temperature industrial processes, and for heating, ventilating and air-conditioning systems.

1959 UK Foundry Exhibition

The exhibition committee of the Foundry Trades Equipment & Supplies Association, who have been given the task of arranging the national foundry exhibition to be held in 1959, have now announced the dates—from Thursday, May 21, to Saturday, May 30. It is to be held in Bingley Hall, Birmingham, and further details and prospectus will be issued in the course of the next month or so.

HARLAND & WOLFF, LIMITED—Mr. W. T. Underwood, chief accountant, has been made a director.

ALEXANDER STEPHEN & SONS, LIMITED—Mr. Alexander M. M. Stephen has been elected a director.

PETO SCOTT ELECTRICAL INSTRUMENTS, LIMITED—Mr. A. T. Black has been appointed managing director.

Personal

The directors of Borax (Holdings), Limited, announce that Mr. J. D. TENNANT, the controller of the Borax (Holdings) Group, has been appointed to the board.

Mr. A. LE THOMAS, the director of the *Centre Technique des Industries de la Fonderie*, has changed his home address to 8, Rue Babie, Meudon (S et O), France.

Mr. GRANVILLE HORSLEY has been appointed a director of Crofts Engineers (Holdings), Limited, and joint managing director of Crofts (Engineers), Limited, of Bradford.

Mr. A. G. B. OWEN, chairman and joint managing director of Rubery, Owen & Company, Limited, has been re-elected president of the Midland branch of the National Union of Manufacturers.

Mr. JOHN DIEBOLD, American authority on automation, is to join with the British management consultants, Urwick, Orr & Partners, Limited, in a new company to be called Urwick, Diebold, Limited.

Prof. JAMES SMALL has been elected president for the ensuing year of the Institution of Engineers and Shipbuilders in Scotland, with Mr. J. A. CAMPBELL BROWN and Mr. A. W. DAVIS as vice-presidents for sessions 1958-61.

Mr. JOSEPH COWLEY, assistant sales manager for Edgar Allen & Company, Limited, Sheffield, has retired at the age of 70 after 56 years' service with the firm. He started as an office boy and became assistant sales manager in 1932.

Mr. LESLIE C. BROWN, Birmingham office manager and technical representative of G. & J. Weir, Limited, Cathcart, Glasgow, retired on March 31. He is succeeded by Mr. GAVIN MURISON, who has been transferred from Weir's London office.

Causeway Reinforcement, Limited, of 66, Victoria Street, S.W.1, announce the appointment of Mr. DESMOND BOWDITCH to the board of the company. Mr. Bowditch joined the company as general manager in 1957, from the Henry C. Stephens, Limited, group of companies where he was also general manager.

Gresham Transformers, Limited, Hanworth, Middlesex, announce that owing to the expanding activities of the group, of which he is chairman, Mr. JOHN P. COLEMAN, has resigned from the board of Data Recording Instrument Company, Limited, and no longer has any financial interest in the company.

Philips Electrical, Limited, announce the following appointments:— Mr. J. D. CALLAWAY, as manager of the Cardiff branch; Mr. D. H. CLARK, as television and radio manager, south-west region, Bristol, and Mr. A. D. SHILLABEER, as electrical-appliances manager, south-west region, Bristol (effective from May 1).

Mr. KENNETH I. EADES, who for several years has been North of England representative for the metals department of Imperial Chemical Industries, Limited, has been appointed sales manager for R. Blackett, Charlton & Company, Limited, Manor Brass Works, Newcastle-upon-Tyne, and also for the associated firm of Charlton, Weddle & Company, Limited, brass founders, Newcastle-upon-Tyne.

June 30 has been fixed as the date on which Mr. CHARLES STOKES will retire from the board of Thos. Firth & John Brown, Limited, the Sheffield steelmakers. He will then have completed 55 years' service, including seven as a director. Mr. Stokes joined John Brown & Company, Limited, in 1903 and became assistant secretary in 1928. When that company and Thos. Firth & Sons, Limited, merged to form the present company he also became assistant secretary of the new company. His appointment as secretary of Thos. Firth & John Brown's followed in 1945, and on nationalization in 1951, when he also ceased connection with John Brown & Company, he was appointed to the board. Mr. Stokes has also served as a director of other companies linked with Thos. Firth & John Brown. He gave up the secretaryship of Firth-Brown's in 1954, but continued as an executive director with special responsibilities in financial matters.

Obituary

The death has occurred of Mr. S. O. CURSLEY, a tutor-draughtsman, at Rolls-Royce, Limited, of Derby, until his retirement four years ago.

Mr. CHARLES ALBERT JACKSON, a director of William Jacks & Company, Limited, metal merchants, of London, E.C.2, has died at Northwood (Middx).

Just over a month after his 100th birthday, the death took place on March 30 of Sir JAMES SWINBURNE, F.R.S., the distinguished consulting engineer, pioneer in the development of plastics, and the honorary president of Bakelite, Limited.

Mr. ARTHUR H. STURDEE, formerly works director of the Birmingham Aluminium Company (1903), Limited, one of the Birmid Industries group, died on April 4 at the age of 77. A well-known figure in the Midlands foundry trade, Mr. Sturdee retired from active work seven years ago.

Commandant of Willenhall Special Constabulary, Mr. WILLIAM COOPER died suddenly on March 30, at the age of 60. Mr. Cooper had been foundry manager of the Shaw Foundry Company, Willenhall, until a few weeks ago, when he moved to the personnel management side. A Willenhall man, he worked at Shaw's all his life. He joined the Special Constabulary at the outbreak of the second world war.

Sir JAMES MILNE, a former director and general manager of the Great Western Railway, died on April 1 at the age of 74. Sir James was an authority on shipping and transportation and was responsible during the second world war for the Railway Executive Committee, which looked after rail transport. It is said that the toughest job he undertook was during the fuel crisis of 1947 when the Cabinet selected him to deal with the fuel transport problem.

By the death last month of Sir JOHN MORISON, the Iron and Steel Holding and Realization Agency, of which he had been chairman since 1953, has sustained a great loss. His qualities, particularly of shrewd judgment and complete integrity, won for him widespread esteem and respect, especially in the realms of high finance and among Ministers of the Crown. Sir John, who was 65, was knighted in 1945 and made G.B.E. in the New Year Honours of 1956. It was in 1953 that he was asked by Mr. R. A. Butler, then Chancellor of the Exchequer, to act as his financial adviser on the financial aspects of the denationalization of the iron and steel industry. Six months later he was appointed the first chairman of the Iron and Steel Holding and Realization Agency. He was educated at Greenock Academy and became a chartered accountant, joining the firm of Thomson, McLintock & Company, and subsequently becoming a partner in the firm. In 1936, he served as a member of the McGowan Committee on Electricity and in 1942 he was appointed Director-General (Finance and Contracts) Ministry of Supply, a post he held in plurality with his membership of the War Damage Commission.

Raw Material Markets

Iron and Steel

At most of the ironfoundries a much larger flow of orders is required to allow production at capacity levels. This applies chiefly to the light and textile foundries, and also to many of the jobbing foundries. The call for light castings continues moderate and, although at this period of the year some improvement could be expected in the demand for builders' castings, this has not yet shown any marked change and economic restrictions continue to hinder normal trading conditions. The substitution of alternative materials for cast iron restricts business, and on account of this some foundries have found it desirable to change over to the production of other types of castings for the busier trades.

The engineering foundries continue to be the most favourably employed. The demand for castings for the motor-vehicle trade is at a good level, and many other users of high-duty castings are also calling for appreciable tonnages, ensuring outputs at good levels for many of these foundries. Business in the machine-tool industry, continuing at reduced levels on previous demands, is limiting the usage of castings in that trade.

Outputs of pig-iron are at good levels and supplies of all grades are sufficient for consumers. In fact, in some irons tonnages available continue well in excess of requirements. The engineering foundries are absorbing the major proportion of outputs of the low-phosphorus irons, which are being produced in adequate tonnages, and they are also using fair quantities of hematite pig-iron and some refined iron. Until there is an improvement in the light-casting trade the present limited demands for high-phosphorus pig-iron are not likely to be stepped up. Producing furnaces are unable to dispose of all their makes, and there are increasing stocks available for overseas buyers when orders can be obtained.

Stocks at the foundries are small. The tonnages ordered are to replace depleted stocks sufficient to cover the orders on hand and there is little forward buying. Supplies of scrap are plentiful, coke deliveries are adequate, and stocks and supplies of ganister, limestone, and firebricks are readily available.

Business at the re-rollers is moderate, but there is little, if any, improvement in the call for small bars and light sections. At some of these mills it has been necessary to adjust working hours in order to avoid redundancy. Many of the heavy re-rollers are also finding it difficult to obtain sufficient orders to make up their rolling programmes for sections and bars. For some sizes of reinforcing rods demands have depreciated and prompt delivery can be given for fresh business.

The supply of steel semis is on a good scale and home steelworks can undertake promptly any orders which arise for normal grades and sizes. Stocks and shortage of work at the re-rollers continue to restrict demands. There is little call for defectives and crops, and the recent reduction of 6s. per ton is much too small to interest the re-rollers in this material.

Non-ferrous Metals

The subdued trading conditions in the markets for non-ferrous metals on both sides of the Atlantic, so apparent in front of the Easter holiday period, continue.

In copper the extension of poor activity arises from a number of factors of which further news as to how the strike is faring at the Chuquicamata Mine in Chile is important, as is the question of shipments by the Anaconda Company of copper from its United States stocks. The Budget was also a restraining influence. But these are factors of substance only because of the generally weak position, particularly in the US, which shows no visible sign of strengthening. In fact, the US custom smelter quotation was brought back last week by ¼ cent to 23½ cents a pound, the price level existing on March 24. US producers, however, are maintaining their quotation at 25 cents a pound.

Of interest is the report from New York that the Braden Mine, the Chilean subsidiary of the Kennecott Copper Corporation, will produce about 13,000 tons this month, which goes against a normal monthly output of around 17,000 tons. This reduction in output is an annual occurrence caused by a decline in the water flow to the hydro-electric plants and usually lasts for about six months.

The tin market is soft in the East and in the United States, while in the UK it is endeavouring to rise above the support point of £730 a ton with varying degrees of success. Better fortune may soon come to this market, as shipments from Malaya are now beginning to fall away noticeably. In March, 3,333 tons were exported, against 4,863 tons in February (a short month), representing a fall of slightly more than 1,500 tons. A small surprise, albeit a welcome one, was the drop in stocks in the UK last week by 178 tons to 18,287 tons. In the US the market is quiet and the price is not far above 92 cents a pound.

Lead continues featureless on both sides of the Atlantic with buying being of a routine nature. In the US the price is 12 cents a pound. Zinc, too, is dull, the only feature being the reduction in US premiums for high-grade zinc. The basic price, however, continues to be marked at 10 cents a pound.

Merger of Construction Company and Foundry

Eagre Construction Company Limited, of Scunthorpe, has taken over one of South Wales' oldest engineering companies. It is the more-than-100-year-old family-owned Isca Foundry Company Limited, of Newport, Monmouthshire, ironfounders, and railway and structural engineers. Mr. John Spafford, now chairman and managing director of both concerns, announces that the whole of the shares of the South Wales firm have been bought by the Eagre Construction Company, Limited. Colonel W. L. C. Phillips, one of the recently retired directors of "Isca," has been appointed manager, with Mr. J. Thomas as secretary. Before this, Mr. Thomas was an accountant with Eagre. Apart from these appointments no further changes in management or staff of the new company are planned for the time being.

Latest Foundry Statistics

Steel Castings:—The Iron and Steel Board in their *Bulletin* for March, give the estimated figure of 6,600 tons for the average weekly output of steel castings during February, an increase of 300 tons on the estimated figure for January. Employment in the steel foundry on February 8 was returned at 20,640.

Ironfounding: According to the Council of Ironfoundry Associations, the number of workers employed in the ironfoundry industry on March 1 was 137,652—an increase of 433 on the figure for February 1. A year ago employment was 139,440, a reduction of 1,788 during the period.

MEET GOVERNMENT REGULATIONS ON

DUST CONTROL

These machines embody the B.S.C.R.A. Patent System of Dust Control and comply with the new Government Regulation 1 of the Grinding of Metals (Misc. Indus.) Regulations, and Regulation 7, para. (6) of the Iron and Steel Foundries Regulations, 1953.

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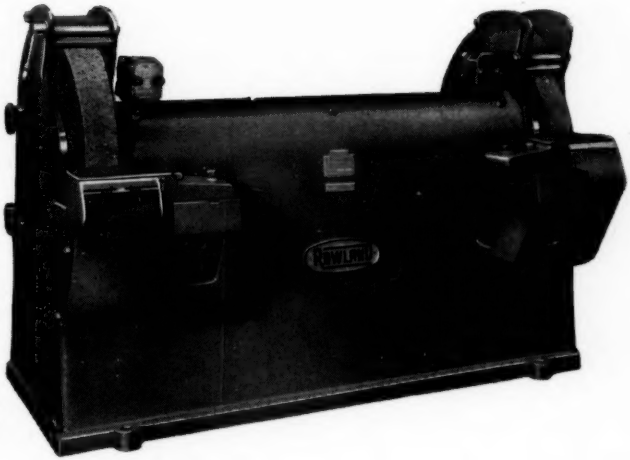
HIGH SPEED

"TWIN DRIVE"

FLOOR GRINDERS

- ★ **Separate driving motors provide independent drive and control to each wheel.**
- ★ **Patent Compulsory Speed Change Device maintains maximum surface speed.**
- ★ **Efficient, foolproof Safety Devices provide adequate protection.**
- ★ **Wheels are collet mounted, not on spindle end, facilitating wheel change and reducing wear of spindle and nut.**
- ★ **Totally enclosed motors avoid electrical breakdown.**
- ★ **Short oversize spindles give maximum rigidity.**
- ★ **Precision pre-loaded A.C. and roller bearings, allied with sturdy all-steel construction give longest life and smoothest running, and maximum wheel performance.**

Built in three sizes with wheels 30in. dia 24in. dia. and 18in. dia. respectively. Also available in the Single Wheel Type in all sizes. Details on request.



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Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

April 16, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 10s. 0d. to £48 0s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £67 0s 0d. to £67 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 8s. 1d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 11s. 1d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 1d. to 1½d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 3½d. to 7s. 10½d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £282 0s. 0d.; 96/98 per cent., £315 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 20s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £173 0s. 0d. to £173 10s. 0d.; three months, £175 0s. 0d. to £175 5s. 0d.; settlement, £173 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 8½d. per lb.; rods, 198s. 3d. per cwt. basis; 20 s.w.g., 231s. 6d. per cwt.

Tin.—Cash, £730 0s. 0d. to £731 0s. 0d.; three months, £729 0s. 0d. to £731 10s. 0d.; settlement, £731 0s. 0d.

Lead (Refined Pig).—Second half April, £72 10s. 0d. to £73 0s. 0d.; second half July, £72 10s. 0d. to £73 0s. 0d.

Zinc.—Second half April, £62 10s. 0d. to £62 15s. 0d.; second half July, £62 10s. 0d. to £62 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £95 10s. 0d.; rolled zinc (boiler plates), all English destinations, £93 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £85 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 4¾d. per lb.; sheets to 10 w.g., 156s. 3d. per cwt.; wire, 2s. 2⅝d.; rolled metal, 156s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £130; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £164; HTB2 (38 tons), —; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £154; LG3 (86/7/5/2), £165; G1 (88/10/2/½), £221; (88/10/2/1), £212.

Phosphor Bronze.—BS1400, PB1 (AID released), £240 per ton.

Phosphor Bronze Strip, etc.—Strip, 225s. 6d. per cwt.; wire, 3s. 5½d. per lb.; rods, 2s. 9½d.; tubes, 2s. 9½d.; chill cast bars: solids 2s. 10½d.; cored 2s. 11½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 9½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 8¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £77 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £200; AB2, — .